[Supplement to The Journal of the Department of Agriculture, Victoria. 10th January, 1916.]

No. 31
AGRICULTURAL CO... COIMBATORE
3098
13 JUN 1935

G. R.

THE JOURNAL

OF THE

DEPARTMENT OF AGRICULTURE

OF

VICTORIA,

AUSTRALIA.

PUBLISHED FOR AND ON BEHALF OF THE GOVERNMENT BY DIRECTION OF THE

HON. F. W. HAGELTHORN, M.L.C.,

Minister for Agriculture.

VOLUME XIII.

1915.

By Authority:
ALBERT J. MULLETT, GOVERNMENT PRINTER, MELBOURNE.
1916

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 1. 11th January, 1915.

GOVERNMENT COOL STORES, VICTORIA DOCK, MELBOURNE.

By R. Crowe, Exports Superintendent.

The new Government Cool Stores, Victoria Dock, Melbourne, were officially opened by His Excellency the Governor, Sir Arthur L. Stanley, K.C.M.G., on Wednesday, 23rd September last. In many respects these stores are unique, as they differ materially from all other freezing works. Most places of the kind are designed to suit the requirements of some special class of business, and nearly all the freezing works in Australasia have been planned to cater for the wants of the meat export trade, whilst these stores have been constructed to meet the particular needs of the trade conducted by the Victorian Department of Agriculture. The handling and freezing of butter for export form a leading feature of the business. Meat comes next in point of importance; then follow poultry, rabbits and hares; and fruit is also provided for.

On the 14th November, 1914, there were stored in the new works 116,397 packages of perishable produce, representing a value of about £150,000.

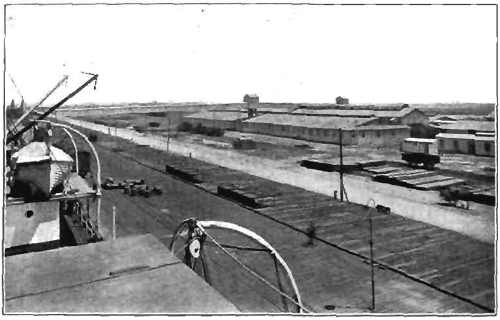
Already Fully Justified.

Had the stores not been in existence this season, the equivalent of produce referred to would have been sacrificed, as all other freezing works in the State were taxed to their utmost through the want of shipping that was encountered in consequence of the war. Important as this aspect of the situation is, it sinks into insignificance when compared with the loss which producers of the State would have sustained had freezing space been restricted by 150,000 or 200,000 carcasses. It can be asserted that, but for the new Government Cool Stores this season, the market in Victoria for lambs, sheep, and beef cattle would have been lower than it was, and producers would have suffered to the extent of shillings per head. From a national point of view, therefore, the stores

have already been amply justified by affording producers fuller prices for their stock than they would otherwise have been able to obtain.

Brief History.

In the year 1888 the Government of the day, finding the producers of the State in a bad position, put aside a large sum of money for the purpose of encouraging and developing an export trade in perishable products. For some years prior to that period, the price of butter used to go down to 3d. per lb. during the spring months; there was no outlet for surplus sheep excepting through the boiling-down plants, where they were converted into tallow; it was a common practice to destroy and bury pigs every alternate year or so. Generally, the requirements of the local demand were too limited, and, when exceeded, the prices of most farm products came down to an unpayable level. The prospect of the producer was, therefore, anything but bright. Consequent, however,



General View of Cool Stores, Victoria Dock, Melbourne.

upon the advent of bonuses, a fillip was given to production on lines calculated to meet the requirements of an export trade. When surplus butter came forward for shipment, it was recognised that it had to be cooled prior to export. As there was a freezing works standing idle at Newport on Government property, an arrangement was made with the owners, and possession taken. In a couple of years' time this place was found inconveniently situated and expensive to work.

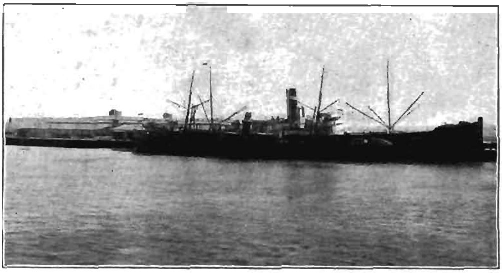
A portion of the insulated accommodation provided at the new City Markets was then leased from the municipality of Melbourne. Before the end of the year the whole of the space there was occupied for promoting the export trade.

Up to the 30th of June, 1914, produce to the value of £27,000,000 had been treated for export at the cool stores managed by the Government since the inception of the trade. For the latter period of the lease—1901 to 1908—the rent, including the use of the machinery, paid by the

Government as tenants of the Melbourne City Corporation amounted to £15,000 per annum, since when the rent has been over £15,000 yearly. This amount was considered excessive, and it being also recognised that the produce of the country required more up-to-date and efficient treatment, the Government decided to erect stores of their own.

SITUATION OF STORES.

In selecting a site and planning the works, the cumulative experience of twenty-five years was brought to bear on the subject. Hitherto delays had been encountered in getting produce conveyed from the railway terminus into the old stores. Hence the site for the new works was selected as close in to the hub of the State railway system as it was possible to get. All trucks containing produce coming forward to Melbourne, whether by goods or mixed trains, are disbanded in the gravitation yard. In this way all trucks containing produce for export are shunted on to one line, whilst those having produce for both local



View of Government Cool Stores from Victoria Dock.

sale and export go into the railway perishable depôt. After the goods for local requirements had been unloaded, the practice was, under the old *régime*, to transfer the contents of the partially-empty trucks into other similar ones, and then shunt out the empties. These operations involved an appreciable amount of labour, time, and exposure of the produce. Transferring and shunting can now be greatly reduced.

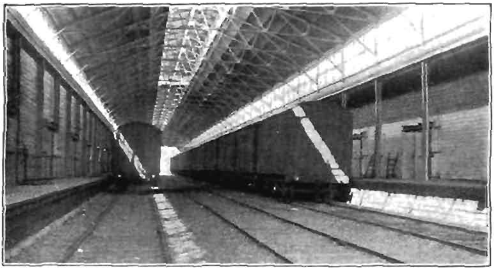
RAILWAY FACILITIES.

At the new site three railway lines serve the inside of the building, the centre one for shunting, whilst two other lines cater for the outside platform. The three platforms total 1,320 feet, so that loading and unloading at several points may be proceeding simultaneously without disturbance from traffic operations, the main consideration being to have the goods delivered into the stores at the earliest possible moment after reaching their destination.

DELIVERY ON TO STEAMERS.

The next great consideration was to have the stores located conveniently for shipping. There are for Melbourne three principal export centres:—Port Melbourne, from which most of the butter has been shipped; Williamstown, where the great bulk of the meat and fruit is loaded; and the export wharf of the Victoria Dock. The Victoria Dock has been steadily growing in favour, and each year an increasing quantity of produce is placed on shipboard there. The further Harbor Trust improvements recently decided upon provide for another dock on the north side of Dudley-street. The new stores will, therefore, be on a sort of peninsula, having streets and wharfs on either side, with overhead connexions both ways to the waterside.

It is not expected that the mail steamers or old type of Liverpool White Star boats will come up to the Victoria Dock for perishable goods; but it is anticipated that, when sufficient inducement offers, the other



Trucks of Produce arriving at Government Cool Stores.

oversea steamers will come into the dock for loading direct from the stores. The use of insulated barges for boats lying at Williamstown and Port Melbourne is under consideration.

FOUNDATIONS.

The site upon which the stores are erected comprises reclaimed swamp land, and consists entirely of silt. Foundations of the usual character were consequently impracticable. Reinforced concrete rafts were, therefore, laid down on the surface for each block of buildings. The rafts are 9 inches thick, and were designed to carry a load of 6 cwt. to the superficial foot. They have been tested up to over 25 per cent. of that weight without deflection. From a sanitary point of view also these rafts form an ideal foundation.

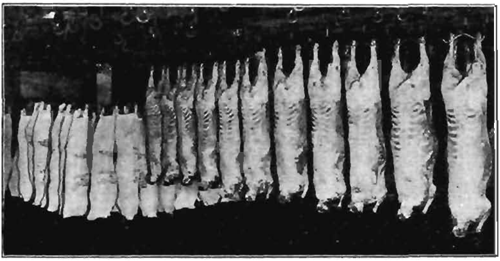
Instead of excavating holes in the ground and putting down concrete foundations for the machinery, the foundations were placed on top of the raft. This plan necessitated the erection of a second floor to bring the operators up to a level with their work.

BUILDINGS.

The buildings consist of timber and galvanized iron, and owing to the nature of the foundations only one story in height. From a refrigerating engineer's stand-point this form of building will be considered wasteful on account of the large outer surfaces over the space insulated, but for the class of business which the Department is engaged in there are redeeming features, such as facilities for handling large quantities of various kinds of produce in and out at the one time, which go to counterbalance the objection referred to. The area roofed in is about 2¾ acres.

CHAMBERS.

There are twenty-nine freezing chambers in the building altogether, three being piped for long storage goods and experimental purposes. All the other chambers are served by air circulation. The fifteen butter chambers are capable of holding 80 tons each, or a total of 1,200 tons. Eight chambers of uniform size are designed to hang 1,000



Meat Freezing Chamber, Government Cool Stores.

carcasses at a time, and seven of these are already fitted up with hangers, whilst there are four special storage chambers, the largest of which can hold over 12,000 carcasses of lamb at a time. The two experimental chambers will be used for solving problems, particularly in connexion with the storage of different kinds of fruits, &c. There are factors still to be settled besides that of temperature, such as humidity, air circulation, ventilation, &c.

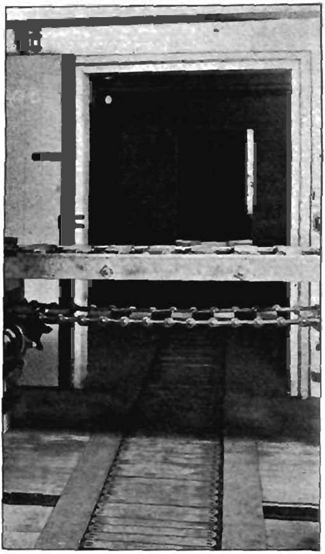
Were the whole of the chambers devoted to the storage of one product, they are capable of holding 155,000 boxes of butter, or 105,000 cases of fruit, or 140,000 carcasses of lamb and mutton.

INSULATION.

All floors, ceilings, and outer insulated walls are filled with pumice, partitions with machine-wood shavings, and doors with granulated cork. Over 1,000 tons of insulation, chiefly pumice, were required. There are 310,000 cubic feet insulated. The ammonia piping connexions to batteries are insulated with hair felt covered with canvas, and painted.

BATTERIES AND AIR SERVICE.

The batteries in the seven coolers are each made up of 9,000 feet of 1¼ inches diameter welded ammonia piping, and provided with a 7 feet diameter fan. A system of baffles and valves in the supply and return air ducts enables the quantity of air to be regulated to suit the different varieties of produce being treated. It is also possible to divide all the chambers into sets of two or more to be independently served, and, on the other hand, one battery only may be used for all the chambers connected. For instance, when meat, fruit, and butter are requiring independent air



Conveyor to Butter-grading Room, Government Cool Stores.

services and temperatures, different batteries are employed respectively; at another time of the year all the chambers in question may be utilized for fruit storage, and then one battery can be made to serve the lot.

TEMPERATURES.

An electric temperature recorder connects each chamber with the engine-room, where the temperatures are booked up hourly. The touching of a key indicates the temperature of any chamber in the engine-room instantly; thus the temperatures are under absolute control without

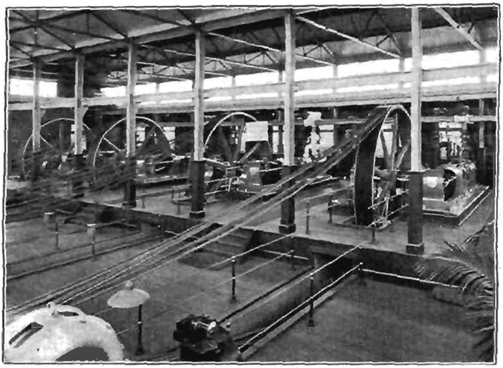
incurring the usual waste by opening chamber doors, and the labour involved thereby. The temperatures and best method of freezing each class of produce are carefully applied. For instance, the experience

Grading Butter, Government Cool Stores.

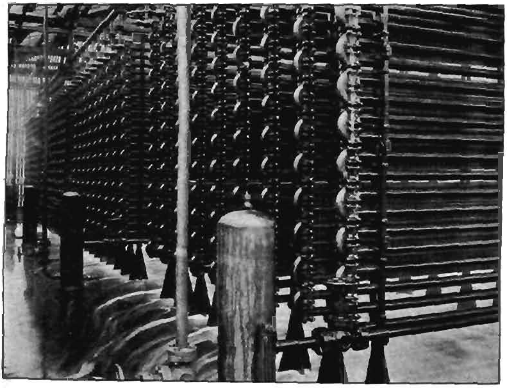
Experimental Chamber, Government Cool Stores.

acquired during a quarter of a century, together with careful experiments conducted from time to time, have proved that the lower the temperature at which butter is maintained, the less the deterioration in storage.

Hitherto, the contract for the oversea carriage of butter provided that the temperature was not to exceed 30 degrees at time of shipment, and



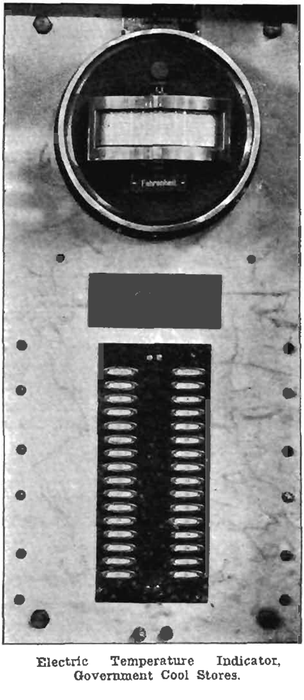
Machinery Room, Government Cool Stores.



Ammonia Condensers, Government Cool Stores (18 miles of piping installed throughout works).

much lower than this temperature was not aimed at. The new Government Cool Stores are designed to reduce the temperature of butter much

faster, and to a lower degree than has been enjoyed by Victorian exporters in the past. Engineers of shipping companies usually check the temperatures of numbers of boxes at ship's side, and in this way fifty-eight brands of butter shipped by R.M.S. *Medina* on the 17th November showed a temperature ranging from 19 to 22 degrees Fahr., or an average of 21.17, whilst twenty-two boxes from other works similarly checked ranged from 25 to 29 degrees Fahr., or an average of 27 degrees. It is obvious, therefore, that butter shipped and carried at the lower temperature will reach its destination in better condition.



Electric Temperature Indicator, Government Cool Stores.

Machinery

All the machinery in the engine-room was made in Melbourne—Ammonia compressors by J. B. Werner and Company Proprietary Limited, Burnley-street, Richmond; electric motors by G. Weymouth Proprietary Limited, Neptune-street, Richmond; and the driving ropes by Messrs. James Miller and Company, Whitehall-street, Yarraville. The ammonia compressors have each a capacity of 100 tons refrigeration per twenty-four hours, giving a total of 400 tons, whilst the electric motors are 150 horse-power each.

There are in the building altogether twenty-four electric motors, totalling 820 horse-power. The installation of four separate uniform units enables the work to be catered for as required. At a slack time of the year the running of one machine will be sufficient. When more produce is coming forward a second can be started, and so on. The possibility of breakdown is also guarded against, as it is most improbable that two machines would fail in the one respect at the same time. All the parts in each machine are interchangeable, and the very latest and most up-to-date details have been embodied in the plant.

POWER.

The current is supplied by the Melbourne City Council, but when the electrification of the Melbourne suburban railways is in full swing the current will be obtained from the Railway Department's power-house.

CONDENSERS.

The ammonia condensing plant is erected in a separate building, and rests on a reinforced concrete tank. The condensers, like the compressors, are in four units. Each combination is capable of being operated singly or coupled into two or three units, or employed as a whole. The condenser contains upwards of 18,000 feet of 2-inch ammonia piping tested up to 300 lbs.; the water supply is 75,000 gallons per hour, pumped from the Victoria Dock. The whole is electrically driven by two 15 horse-power motors direct coupled to the circulating pumps. Between the condenser, batteries, pipe chambers, and connexions there are altogether over 18 miles of piping installed.

CONVEYORS.

The mechanical conveyors are nearly 5,000 feet long. Doubled as they are for working, the length in action would be nearly 2,500 feet. Produce can be placed on conveyors at any point, and mechanically carried to any chamber in the building, or from any chamber into the hands of men stowing in ship's hold.

Even if workmen washed their hands hourly, packages would become more or less stained with frequent handling; in addition, packages get knocked about, and a percentage is damaged by repeated handlings. Mechanical conveyors will obviate both breakage and disfigurement of goods, and, of course, save a good deal of labour and expense.

SODIUM CHLORIDE (COMMON SALT) USED AS A MANURE.

The use of sodium chloride as a manure has been largely abandoned since it became known that neither sodium nor chlorine (the elements constituting this compound) were essential plant foods, yet recent experiments in Sweden, conducted by Professor H. C. Söderbaum, Director of the Chemical Section of the Swedish Central Experimental Section, have yielded encouraging results

The experimenter found that sodium chloride affected the various crops differently, and concludes that applications of common salt might frequently replace potash dressings with advantage, especially in the case of root crops (mangolds in particular), and that the beneficial effect is due to the chlorine content or some other factor, and not its sodium content.—Extract from *Fertilizers*, 27th June, 1914.

THE ARTIFICIAL MANURES ACTS.

UNIT VALUES FOR 1915.

By P. Rankin Scott, Chemist for Agriculture.

The amending Artificial Manures Act of 1910 requires that manufacturers or importers shall, on or before the 1st November in each year, register the brand of the several fertilizers, and at the same time supply to the Secretary for Agriculture, under declaration, the name and address of manufacturer or importer, the place of manufacture, the raw material from which the manure is manufactured or prepared, a statement of the percentages of nitrogen, phosphoric acid, and potash, together with the respective forms in which they occur, and the retail price per ton. From the information so obtained the unit values of the constituents which have a commercial value are calculated. These unit values so obtained constitute the basis of calculating the values of all manures for the period during which the registered brands continue in force, *i.e.*, until the publication in the *Government Gazette* of the list of registered brands for the following season.

A fixed limit of deficiency is allowed in all fertilizers. (See Schedule hereunder.)

When a manure on analysis is shown to contain less nitrogen, phosphoric acid, or potash than the proportions stated on the label or invoice certificate, to the extent set forth in the Schedule the vendor is liable to a fine of £10 for a first offence, and £50 for any subsequent offence.

SCHEDULE.

Description of Manure.	Percentage of Deficiency allowed in regard to Ingredients of Fertilizing Value.				
	Nitrogen.	Potash readily soluble.	Phosphoric Acid.		
			Water soluble.	Citrate soluble.	Citrate insoluble.
All manures containing Nitrogen	0·50				
All manures containing Potash ...	...	1·00			
All manures containing Water Soluble Phosphoric Acid	...	..	1·00		
All manures containing Citrate Soluble Phosphoric Acid ...	...	...	...	1·00	
All manures containing Citrate Insoluble Phosphoric Acid ...	..	...	..	...	1·00

NOTE.—Provided that the total phosphoric acid deficiency shall not exceed 1·50 per cent.

Regarding the label and invoice certificate referred to above, sections 5 and 7 of the principal Artificial Manures Act of 1904 stipulate that the vendor shall attach to each bag a label or tag declaring the

composition of the manure, and shall deliver to all purchasers of manure, at the time of sale, an invoice certificate, conveying similar information to that required to be stated on the label.

From the unit values and the guarantee contained on the tags or invoice certificates, it can be readily ascertained (sée method of calculation) whether the price asked for a fertilizer is a reasonable one.

In basing a valuation on mixed manures, by this method of calculation, the price asked generally exceeds the commercial value of the fertilizing ingredients contained in them, the increased cost of these mixed manures represents the cost of mixing, bagging, &c.

The Valuation of Manures from Analysis.

The commercial value of a manure can be ascertained by multiplying the percentage of the nitrogen, phosphoric acid or potash content, as stated on the tag or invoice certificate, by the unit value fixed for the ingredient according to the form in which it occurs in the manure.

As for example, bonedust should have a label affixed to the bag stating the total percentage of nitrogen and phosphoric acid together with the percentage of fine and coarse bone guaranteed in the manure.

Now, as no two bonedusts contain the same percentage of these ingredients, the following example will demonstrate how to calculate the correct commercial value per ton—

Bonedust—

Nitrogen	3.75 per cent.
Phosphoric acid ...	21.50 ,,
Mechanical condition—	
Fine bone ...	42.50 ,,
Coarse bone ...	57.50 ,,

The unit values of these ingredients as fixed for the year, as contained in the table, showing same, is:—

Nitrogen, as fine bone ...	£0 15 0 per unit.
Nitrogen, as coarse bone ...	0 13 0 ,,
Phosphoric acid, as fine bone ...	0 4 6 ,,
Phosphoric acid, as coarse bone ...	0 3 6 ,,

First determine the proportion of nitrogen as fine bone by multiplying the percentage of nitrogen by the percentage of fine bone and dividing by 100—as for example—

$$\frac{3.75 \times 42.5}{100} = 1.59 \text{ per cent of fine bone.}$$

The other ingredients are estimated in a similar manner according to the percentage as stated on the tag; consequently this particular bonedust results as follows:—

Nitrogen, in fine bone ...	1.59 per cent.
Nitrogen in coarse bone ...	2.16 ,,
Phosphoric acid in fine bone ...	9.14 ,,
Phosphoric acid in coarse bone ...	12.36 ,,

To determine the commercial value per ton, multiply the percentage amount of each ingredient by the unit value for same, as follows:—

Nitrogen, as fine bone	1.59 ×	£0 15 0	£1 3 10
Nitrogen, as coarse bone	2.16 ×	0 13 0	1 8 1
Phosphoric acid, as fine bone	9.14 ×	0 4 6	2 1 2
Phosphoric acid, as coarse bone	12.36 ×	0 3 6	2 3 3
Value per ton			£6 16 4

Another example may be cited, that of a bone fertilizer.

The tag accompanying each bag of typical low-grade bone fertilizer should state the total nitrogen, and the citrate soluble and citrate insoluble phosphoric acid content, as under:—

Nitrogen	3.00 per cent.
Phosphoric acid, citrate soluble	3.00 ,,
Phosphoric acid, citrate insoluble	12.00 ,,
Phosphoric acid, total	15.00 ,,

The unit values affixed for these ingredients in this manure are as follow:—

Nitrogen	£0 13 0
Phosphoric acid, citrate soluble	0 4 6
Phosphoric acid, citrate insoluble	0 3 0

To determine the value per ton of this manure, multiply the percentage of each ingredient by the unit value for same, as follows:—

Nitrogen	3.00 ×	£0 13 0	£1 19 0
Phosphoric acid, citrate soluble	3.00 ×	0 4 6	0 13 6
Phosphoric acid, citrate insoluble	12.00 ×	0 3 0	1 16 0
Value per ton			£4 8 6

These two examples are intended to draw attention to the difference between a bonedust and a bone fertilizer. In the first place, it will be evident that the form of guarantee is different. That being so, there must be some reasons for this. The answer is best supplied by a clause in the principal Act, which describes a bonedust as consisting only of bones and recently disintegrated animal matter. When a manure contains other ingredients, it can no longer be recognised as a bonedust. To meet this, the term bone fertilizer originated. A bone fertilizer is a manure containing besides bones and animal matter, some other ingredients added in the process of manufacture. Bone fertilizers classed as high grade are similar in all respects to an ordinary bonedust, but differ in containing foreign materials, principally gypsum, as an adulterant. This material has no manurial value according to the Act, but is used to lessen the loss of nitrogen. The low-grade bone fertilizer is practically a mixed manure, starting with bonedust as a base. The phosphoric acid is added to by ground rock phosphate and superphosphate. The addition of the ground rock phosphate alters the solubility of the manure, rendering its phosphoric acid content more difficultly soluble; these manures are therefore generally guaranteed as containing the greater portion of their phosphoric acid in an insoluble condition.

As stated before in connexion with difficultly soluble manures, the value of a manure for a quick return from an agricultural stand-point depends principally on its content of readily available ingredients. In using manures, therefore, a buyer will be best served by employing those manures which contain the greater percentage of readily available ingredients. Bonedust is preferable to bone fertilizer, because it is more soluble when applied to the average soil.

Artificial Manures Act.

T VALUES FOR THE YEAR 1915 AS CALCULATED FROM THE DECLARED PRICES OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE.

	s.	d.
1 per cent. of Nitrogen as Nitrate	18	8
1 per cent. of Nitrogen as Ammonia	15	5
1 per cent. of Nitrogen as Blood	16	9
1 per cent. of Nitrogen as Fine Bone	15	0
1 per cent. of Nitrogen as *Coarse Bone* and Flesh	13	0
1 per cent. of Phosphoric Acid as Water Soluble	4	7
1 per cent. of Phosphoric Acid as Citrate Soluble	4	6
1 per cent. of Phosphoric Acid as *Fine Bone*	4	6
1 per cent. of Phosphoric Acid as Coarse Bone	3	6
1 per cent. of Phosphoric Acid as Insoluble in Thomas Phosphate and High-grade Bone and Animal Fertilizers	3	6
1 per cent. of Phosphoric Acid as Insoluble in Low-grade Bone Fertilizers and Bone and Super.	3	0
1 per cent. of Phosphoric Acid in Superphosphate and Nitro Supers.	2	0
1 per cent. of Potash as Sulphate	5	8
1 per cent. of Potash as Chloride	4	10

Note.—*Potash as Sulphate in Kainit.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Mainly Nitrogenous.						
Nitrate of Soda	Federal S.N. ..	15·50	..	..	14 10 0	Australian Explosives and Chemical Co., Melbourne
"	Sickle	15·50	..	..	14 10 0	Cuming, Smith, and Co., Melbourne
"	Hasell's	15·50	..	..	14 7 6	A. H. Hasell, Melbourne
"	M.L.	15·50	..	..	14 10 0	Mt. Lyell M. and R. Co., Melbourne
"	Wischer and Co. ..	15·50	..	..	14 10 0	Wischer and Co., Melbourne
Nitrate of Potash	Sickle	13·00	..	44·00	28 0 0	Cuming Smith, and Co., Melbourne
"	M.L.	13·00	..	44·00	28 0 0	Mt. Lyell M. and R. Co., Melbourne
Sulphate of Ammonia	Federal A.S. ..	20·00	..	..	16 0 0	Australian Explosives and Chemical Co., Melbourne
" "	B.G. Co. ..	20·00	..	..	14 0 0	Ballarat Gas Co., Ballarat
" "	Sickle	20·00	..	..	16 0 0	Cuming, Smith, and Co., Melbourne
" "	Hasell's	20·00	..	..	15 17 6	A. H. Hasell, Melbourne
" "	M.G. Co.	20·00	..	..	14 0 0	Metropolitan Gas Co., Melbourne
" "	M.L.	20·00	..	..	16 0 0	Mt. Lyell M. and R. Co., Melbourne
" "	Wischer and Co. ..	20·00	..	..	16 0 0	Wischer and Co., Melbourne
Blood	Imperial	11·50	1·00	0·18	9 0 0	W. Angliss and Co., Melbourne
"	Federal Blood ..	7·50	1·00	..	6 10 0	Australian Explosives and Chemical Co., Melbourne
* "	Champion	9·50	1·50	0·09	7 10 0	John Cooke and Co. Pty. Ltd., Melbourne
"	Sickle	7·50	1·00	..	6 10 0	Cuming, Smith, and Co., Melbourne
"	Hasell's	7·50	1·00	..	6 10 0	A. H. Hasell, Melbourne
"	M.C.C.	7·50	1·00	0·41	5 0 0	Melbourne City Council, Melbourne
Blood "A"	M.L.	11·00	..	..	10 0 0	Mt. Lyell M. and R. Co., Melbourne
Blood "B"	"	7·50	1·00	..	6 10 0	" " " "
Blood	Rohs	8·75	..	..	8 0 0	P. Rohs, Bendigo
"	Wischer and Co ..	7·50	1·00	..	6 10 0	Wischer and Co., Melbourne
Mainly Potash.						
Potash Chloride (Muriate) ..	Federal P.M. ..	..	..	60·00	14 10 0	Australian Explosives and Chemical Co., Melbourne
" "	Sickle	..	..	60·00	14 10 0	Cuming, Smith, and Co., Melbourne
" "	M.L.	..	..	60·00	14 10 0	Mt. Lyell M. and R. Co., Melbourne
" "	Wischer and Co. ..	..	..	60·00	14 10 0	Wischer and Co., Melbourne
Kainit	Sickle	..	..	12·40	5 0 0	Cuming, Smith, and Co., Melbourne
"	M.L.	..	..	12·40	5 0 0	Mt. Lyell M. and R. Co., Melbourne
"	Wischer and Co. ..	..	..	12·40	5 0 0	Wischer and Co., Melbourne
Sulphate of Potash, 90% ..	Federal P.S. ..	..	..	48·00	13 10 0	Australian Explosives and Chemical Co., Melbourne
"	" " ..	..	..	51·00	14 12 6	" " " " "
" 90%	Sickle	..	..	48·00	13 10 0	Cuming, Smith, and Co., Melbourne
" 95%	"	..	..	51·00	14 12 6	" " " "
" "	Hasell's	..	..	52·00	20 0 0	A. H. Hasell, Melbourne
" "B"	M.L.	..	..	48·00	13 10 0	Mt. Lyell M. and R. Co., Melbourne
" "A"	"	..	..	51·00	14 12 6	" " " "
" 90%	Wischer and Co. ..	..	..	48·00	13 10 0	Wischer and Co., Melbourne
" 95%	" " ..	..	..	51·00	14 12 6	" " "

* Not for retail

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued*.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable
			Water Soluble.	Citrate Soluble.	In-soluble.	Total.			
Mainly Phosphoric Acid readily Soluble.		%	%	%	%	%	%	£ s. d.	
Superphosphate ..	Federal O.S. ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Australian Explosives and Chemical Co., Melbourne
" ..	Florida Sickle ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Cuming, Smith, and Co., Melbourne
" ..	Hasell's	..	17·50	0·50	2·00	20·00	..	4 7 6	A. H. Hasell, Melbourne
Superphosphate, No. 1 ..	M.L.	..	17·00	1·00	2·00	20·00	..	4 7 6	Mt. Lyell M. and R. Co., Melbourne
Superphosphate ..	Rohs	..	16·85	1·70	0·45	19·00	..	4 10 0	P. Rohs, Bendigo
Superphosphate, No. 1 ..	Wischer and Co. ..	..	17·00	1·00	2·00	20·00	..	4 7 6	Wischer and Co., Melbourne
Concentrated Superphosphate	Federal Conc. S. ..	..	40·00	4·00	..	44·00	..	12 10 0	Australian Explosives and Chemical Co., Melbourne
" " "	Sickle Conc. Super.	..	40·00	4·00	..	44·00	..	12 10 0	Cuming, Smith, and Co., Melbourne
" " "	M.L. Conc. Super. ..	..	40·00	4·00	..	44·00	..	12 10 0	Mt. Lyell M. and R. Co., Melbourne
" " "	Wischer and Co. Conc Super.	..	40·00	4·00	..	44·00	..	12 10 0	Wischer and Co., Melbourne
Mainly Phosphoric Acid moderately Soluble.									
Thomas Phosphate ..	Federal	..	..	14·00	3·00	17·00	..	4 7 6	Australian Explosives and Chemical Co., Melbourne
" " ..	Sickle	..	..	14·00	3·00	17·00	..	4 7 6	Cuming, Smith, and Co., Melbourne
" " ..	Hasell's	..	..	14·00	3·00	17·00	..	4 2 6	A. H. Hasell, Melbourne
" " ..	M.L.	..	..	14·00	3·00	17·00	..	4 7 6	Mt. Lyell M. and R. Co., Melbourne
" " ..	Wischer and Co ..	..	..	14·00	3·00	17·00	..	4 7 6	Wischer and Co., Melbourne
Mainly Phosphoric Acid and Nitrogen difficultly Soluble—High Grade.									
*Bone Fertilizer ..	Redbank J.C. ..	6·00	..	6·70	7·30	14·00		6 0 0	J. Cooke and Co., Melbourne
" " ..	Magic	5·00	..	3·00	10·00	13·00	..	6 10 0	G. Gardiner and Co., Geelong
" " ..	Horseshoe ..	3·50	..	4·70	10·70	15·40	..	5 15 0	P. Fitzgerald and Sons, Bentleigh
" " ..	Ark	3·72	..	3·98	12·90	16·88	.	6 0 0	A. Murphy, Ararat
*Animal Fertilizer ..	Champion ..	6·50	..	4·50	5·00	9·50	.	6 0 0	J. Cooke and Co., Melbourne
Low Grade.									
Bone Fertilizer	Federal B.F. .	3·00	..	3·00	13·00	16·00	..	6 2 6	Australian Explosives and Chemical Co., Melbourne
"	Sickle	3·00	..	3·00	13·00	16·00	..	6 2 6	Cuming, Smith, and Co., Melbourne
Fertilizer, No. 1 ..	Magic	2·00	..	3·00	14·00	17·00	..	5 5 0	G. Gardiner and Co., Geelong
Fertilizer, No. 2 ..	"	1·50	..	3·00	13·00	16·00		5 0 0	" "
Bone Fertilizer, "A" ..	Hasell's	4·25	..	5·00	14·00	19·00	..	7 0 0	A. H. Hasell, Melbourne

Bone Fertilizer, "B" ..	Hasell's	3·48	..	3·77	15·43	19·20	..	6 15 0	A. H. Hasell, Melbourne
Bone Fertilizer, "C" ..	"	2·52	..	2·73	15·51	18·24	..	5 15 0	" "
Bone Fertilizer, "B" ..	M.L.	3·00	..	3·00	13·00	16·00	..	6 2 6	Mt. Lyell M. and R. Co., Melbourne
Animal Fertilizer ..	A.N.A. Surprise ..	3·00	..	4·00	12·00	16·00	..	6 0 0	G. W. Pennell, Braybrook
Bone Fertilizer	Wischer and Co. ..	3·00	..	3·00	13·00	16·00	..	6 2 6	Wischer and Co., Melbourne
Blood and Bone Fertilizer	Federal B. and B.F.	5·00	..	3·00	12·00	15·00	..	7 0 0	Australian Explosives and Chemica Co., Melbourne
" " "	Sickle	5·00	..	3·00	12·00	15·00	..	7 0 0	Cuming, Smith, and Co., Melbourne
Blood and Bone Fertilizer, "A"	M.L.	5·00	..	3·00	12·00	15·00	..	7 0 0	Mt. Lyell M. and R. Co., Melbourne
Blood and Bone Fertilizer	Wischer and Co ..	5·00	..	3·00	12·00	15·00	.	7 0 0	Wischer and Co., Melbourne
Moderately Soluble.									
Dissolved Bone and Superphosphate	Sickle	1·00	10·01	3·88	5·48	19·37	.	5 10 0	Cuming, Smith, and Co., Melbourne
" " "	M.L.	1·00	10·00	3·75	5·25	19·00	.	5 10 0	Mt. Lyell M. and R. Co., Melbourne
" " "	Wischer and Co .	1·00	10·00	3·75	5·25	19·00	..	5 10 0	Wischer and Co., Melbourne
Nitro Superphosphate ..	Federal N.S. .	1·10	13·00	1·00	5·00	19·00	..	5 10 0	Australian Explosives and Chemical Co., Melbourne
" " ..	Sickle	2·00	13·00	0·76	2·52	16·28	.	5 10 0	Cuming, Smith, and Co., Melbourne
" " ..	Hasell's	1·50	14·00	1·00	3·00	18·00	.	6 8 6	A. H. Hasell, Melbourne
" " ..	M.L. .. .	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Mt. Lyell M. and R. Co., Melbourne
" " ..	Wischer and Co ..	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Wischer and Co., Melbourne
Bone and Blood Fertilizer and Superphosphate	Federal B.B.S. ..	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Australian Explosives and Chemical Co., Melbourne
Bone and Blood Fertilizer and Superphosphate, "B"	Sickle	2·50	8·50	2·00	7·06	17·50	.	6 5 0	Cuming, Smith, and Co., Melbourne
Bone and Blood Fertilizer and Superphosphate	M.L.	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Mt. Lyell M. and R. Co., Melbourne
" " "	Wischer and Co. .	2·50	8·50	2·00	7·00	17·50	..	6 5 0	Wischer and Co., Melbourne
High Grade.									
Bone and Superphosphate	Magic	1·25	8·00	3·20	5·80	17·00	.	5 5 0	G. Gardner and Co., Geelong
" " ..	Rohs . ..	1·50	9·00	2·25	5·75	17·00		5 10 0	P. Rohs, Bendigo
Low Grade.									
Bone Fertilizer and Superphosphate	Federal B.S. No 1	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Australian Explosives and Chemical Co., Melbourne
" " "	Federal B.S. No. 3	0·75	12·75	1·75	4·50	19·00	.	5 5 0	" " " "
Bone Fertilizer and Superphosphate, "A"	Sickle	1·50	8·50	3·50	6·00	18·00	.	5 12 6	Cuming, Smith, and Co., Melbourne
Bone Fertilizer and Superphosphate, "C"	"	0·75	12·75	1·75	4·50	19·00	.	5 5 0	" " "
Bone and Superphosphate, one-quarter and three-quarters	Hasell's	0·80	12·75	1·00	5·50	19·25	..	5 4 0	A. H. Hasell, Melbourne
Bone and Superphosphate, one-half and one-half	"	1·50	8·50	0·50	9·50	18·50	..	5 11 6	" "
Bone Fertilizer and Superphosphate, No. 1	M.L.	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Mt. Lyell M. and R. Co., Melbourne

* Not for retail.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. *Total.*	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	%	%	%	£ s. d.	
Low Grade—continued.									
Bone Fertilizer and Superphosphate, No. 2	M.L.	0·75	12·75	1·75	4·50	19·00	..	5 5 0	Mt. Lyell M. and R. Co., Melbourne
Animal Fertilizer and Superphosphate	A.N.A. Surprise ..	1·50	7·50	2·00	7·00	16·50	..	5 15 0	G. W. Pennell, Braybrook
Bone Fertilizer and Superphosphate, No. 1	Wischer and Co. ..	1·50	8·50	3·50	6·00	18·00	..	5 12 6	Wischer and Co., Melbourne
Bone Fertilizer and Superposphate, No. 2	.. .. ..	0·75	12·75	1·75	4·50	19·00	..	5 5 0	.. .. ..
Containing Nitrogen, Phosphoric Acid, and Potash.									
Grass (Laying Down) ..	Federal G.L. ..	0·50	11·00	0·64	6·30	17·94	2·00	5 5 0	Australian Explosives and Chemical Co., Melbourne
Grass (Top Dressing) ..	Federal T.D ..	1·60	11·00	0·64	1·30	12·94	1·50	5 5 0	.. ..
Horticultural	Federal H.M ..	2·50	11·62	0·68	1·38	13·68	10·00	9 0 0	.. ..
Maize	Federal M Z. ..	2·36	10·20	0·60	6·20	17·00	2·00	6 7 6	.. ..
Onion	Federal M.G. ..	2·00	11·00	0·64	1·30	12·94	5·00	6 7 6	.. ..
Orchard	Federal F.M.	1·80	13·22	0·78	1·55	15·55	8·00	7 7 6	.. ..
Pea, Bean, and Clover ..	Federal P.B. ..	0·50	10·00	0·60	4·20	14·80	3·00	5 5 0	.. ..
Potato	Federal *Potato* ..	1·00	14·00	0·80	1·64	16·44	5·00	6 7 6	.. ..
Beet	Federal Beet ..	4·50	11·00	0·75	1·25	13·00	5·50	8 12 6	.. ..
Vine	Federal V.S.P. ..	7·00	7·15	0·42	0·84	8·41	12·00	12 10 0	.. ..
A. and P. Mildura, No. 1	Sickle	3·46	9·41	0·55	1·10	11·06	11·60	9 7 6	Cuming, Smith, and Co., Melbourne
Citrus, Mildura, No. 1 ..	,, ...	1·39	3·79	0·22	7·87	11·88	16·25	8 15 0	.. ..
Grass	,, ...	0·30	11·05	0·65	8·85	20·55	3·00	5 5 0	.. ..
Horticultural	.. .. ..	4·00	11·22	0·66	1·32	13·20	8·40	9 0 0	.. ..
Maize	,, ...	2·20	14·62	0·86	1·72	17·20	1·80	6 7 6	.. ..
Onion	.. ..	2·00	13·60	0·80	1·60	16·00	3·60	6 7 6	.. ..
Orchard ..	,, ...	2·40	12·92	0·76	1·52	15·20	7·20	7 7 6	.. .. ..
Potato, "A"	,, ...	1·30	8·00	3·10	5·88	16·98	5·20	7 0 0	.. .. ..
Potato, "B"	.. .. ..	1·20	14·62	0·86	1·72	17·20	4·16	6 7 6	.. ..
Root Crop	.. .. ..	1·30	8·00	3·10	5·88	16·98	5·20	7 0 0	.. ..
Rose	.. .. ..	3·94	6·18	0·36	0·72	7·26	13·94	12 0 0	.. ..
Vine, Mildura, No. 1 ..	.. .. ..	5·53	7·14	0·42	0·84	8·40	11·60	10 15 0	.. ..

Vine, Mildura, No. 3	Sickle	7·14	7·14	0·42	0·84	8·40	11·00	11	2	6	Cuming, Smith, and Co., Melbourne
Vine	,, ...	2·40	12·92	0·76	1·52	15·20	7·20	7	7	6	,, ,, ,, ,,
Vine, "B"	,, ...	1·25	10·62	0·63	5·00	16·25	7·50	6	15	0	,, ,, ,, ,,
Fodder Crop	Hasell's	3·00	11·50	1·00	2·00	14·50	1·00	6	8	6	A. H. Hasell, Melbourne
Grass	,, ...	0·40	11·25	1·00	8·50	20·75	2·50	5	10	0	,, ,,
Horticultural	,, ...	3·80	11·00	0·50	2·00	13·50	8·00	9	10	0	,, ,,
Lawn Manure	,, ...	0·40	11·25	1·00	8·50	20·75	2·50	5	10	0	,, ,,
Maize	,, ...	3·00	11·50	1·25	2·00	14·75	1·00	6	8	6	,, ,,
Onion	,, ...	3·00	9·50	1·00	1·50	12·00	3·06	6	12	6	,, ,,
Orchard	,, ...	2·00	14·00	0·75	0·25	15·00	7·14	8	0	0	,, ,,
Potato	,, ...	1·00	12·75	0·75	2·00	15·50	6·00	6	17	6	,, ,,
Root Crop	,, ...	3·20	8·00	1·00	2·50	11·50	4·50	7	5	0	,, ,,
Sugar Beet	,, ...	4·00	11·00	0·75	1·25	13·00	8·20	9	13	6	,, ,,
Tomato	,, ...	3·80	11·00	0·50	2·00	13·50	8·00	9	10	0	,, ,,
Vine	,, ...	2·00	14·00	0·75	0·25	15·00	7·14	8	0	0	,, ,,
A. and F., No. 1, Mildura	M.L.	4·46	9·41	0·55	1·10	11·06	11·57	9	12	6	Mt. Lyell M. and R. Co., Melbourne
Barley	,, ...	0·80	15·00	1·00	1·50	17·50	2·00	5	10	0	,, ,, ,, ,,
Citrus, No. 1, Mildura ..	,, ...	1·39	3·61	0·21	7·82	11·64	16·88	8	17	6	,, ,, ,, ,,
Fodder Crop	,, ...	3·00	11·84	0·70	2·46	15·00	1·00	6	7	6	,, ,, ,, ,,
Grass (Laying Down) ..	,, ...	0·30	11·05	0·65	9·05	20·75	2·70	5	5	0	,, ,, ,, ,,
Grass (Top Dressing) ..	,, ...	0·90	12·00	3·50	1·50	17·00	1·00	5	5	0	,, ,, ,, ,,
Horticultural	,, ...	4·00	11·00	0·75	1·45	13·20	8·25	9	0	0	,, ,, ,, ,,
Lawn	,, ...	0·90	12·00	3·50	1·50	17·00	1·00	5	5	0	,, ,, ,, ,,
Maize	,, ...	3·00	11·84	0·70	2·46	15·00	1·00	6	7	6	,, ,, ,, ,,
Onion	,, ...	3·00	10·35	0·61	2·04	13·00	3·00	6	7	6	,, ,, ,, ,,
Orchard	,, ...	2·35	13·00	0·75	1·50	15·25	7·20	7	7	6	,, ,, ,, ,,
Potato	,, ...	1·20	14·50	1·00	1·70	17·20	4·15	6	7	6	,, ,, ,, ,,
Potato (with Bone) ..	,, ...	1·05	8·50	0·50	7·30	16·30	8·80	7	0	0	,, ,, ,, ,,
Rape	,, ...	1·00	15·00	1·00	2·50	18·50	1·00	5	10	0	,, ,, ,, ,,
Root Crop	,, ...	3·18	9·59	0·56	2·13	12·28	4·75	6	17	6	,, ,, ,, ,,
Rose	,, ...	4·00	6·50	0·50	0·50	7·50	14·00	12	0	0	,, ,, ,, ,,
Tomato	,, ...	4·00	11·00	0·75	1·45	13·20	8·25	9	0	0	,, ,, ,, ,,
Vine	,, ...	2·35	13·00	0·75	1·50	15·25	7·20	7	7	6	,, ,, ,, ,,
Vine, "B"	,, ...	1·25	10·63	0·63	5·24	16·50	7·50	6	15	0	,, ,, ,, ,,
Vine, No. 1, Mildura ..	,, ...	5·53	6·98	0·41	0·82	8·21	12·07	10	15	0	,, ,, ,, ,,
Vine, No. 3, Mildura ..	,, ...	7·14	6·98	0·41	0·82	8·21	12·07	11	5	0	,, ,, ,, ,,
Vine, No. 5, Mildura ..	,, ...	1·00	5·67	0·34	6·00	12·01	17·33	8	15	0	,, ,, ,, ,,
Vine, No. 6, Mildura ..	,, ...	1·12	6·37	0·38	6·75	13·50	13·00	7	17	6	,, ,, ,, ,,
Grass	Wischer and Co. ..	0·75	9·77	0·57	5·16	15·50	2·60	5	5	0	Wischer and Co., Melbourne
"Key" Fertilizer ..	,, ,, ..	0·50	15·30	0·90	1·80	18·00	2·60	5	15	0	,, ,, ,,
Hop Manure	,, ,, ..	2·00	13·60	0·80	1·60	16·00	5·20	7	2	6	,, ,, ,,
Horticultural	,, ,, ..	3·00	11·26	0·66	1·33	13·25	9·75	9	0	0	,, ,, ,,
Maize	,, ,, ..	1·75	14·66	0·86	1·75	17·27	2·60	6	7	6	,, ,, ,,
Market Gardener's ..	,, ,, ..	3·38	9·35	0·55	1·10	11·00	6·50	7	7	6	,, ,, ,,
Nurseryman's Plant Food	,, ,, ..	5·00	8·50	0·50	1·00	10·00	13·00	12	0	0	,, ,, ,,
Onion	,, ,, ..	2·50	9·35	0·55	1·10	11·00	4·55	6	7	6	,, ,, ,,
Orchard	,, ,, ..	3·38	9·35	0·55	1·10	11·00	6·50	7	7	6	,, ,, ,,
Potato (with Bone) ..	,, ,, ..	1·05	8·50	0·50	6·60	15·60	7·80	7	0	0	,, ,, ,,
Potato	,, ,, ..	0·94	12·97	0·76	1·52	15·25	5·85	6	7	6	,, ,, ,,
Rape	,, ,, ..	1·00	15·00	1·00	2·50	18·50	1·00	5	10	0	,, ,, ,,
Rose	,, ,, ..	4·00	6·80	0·40	0·80	8·00	15·60	12	0	0	,, ,, ,,
Vine	,, ,, ..	3·00	8·50	0·50	1·00	10·00	7·80	7	7	6	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
		%	%	%	%	%	%	£ s. d.	
Containing Phosphoric Acid and Potash only.									
Special Grain	Federal S.G. ..	..	16·50	1·00	2·00	19·50	0·75	5 0 0	Australian Explosives and Chemical Co., Melbourne
" "	Federal S.G., No. 1	..	16·50	1·00	2·00	19·50	1·50	5 5 0	" " " "
Leguminous	Sickle ..	..	15·30	1·00	1·90	18·20	2·60	5 5 0	Cuming, Smith, and Co., Melbourne
"	Hasell's ..	..	12·00	1·00	3·00	16·00	4·59	5 15 0	A. H. Hasell, Melbourne
"	M.L. ..	..	15·30	1·00	1·90	18·20	2·60	5 5 0	Mt. Lyell M. and R. Co., Melbourne
"	Wischer and Co. ..	..	15·30	0·90	1·80	18·00	2·60	5 5 0	Wischer and Co., Melbourne
Pea	" " ..	..	14·45	0·85	1·70	17·00	7·80	6 10 0	" " "
Containing Nitrogen and Phosphoric Acid only.									
Rape	Federal Rape ..	2·00	13·00	0·76	2·52	16·28	..	5 10 0	Australian Explosives and Chemical Co., Melbourne
A. and P., Mildura, No. 2	Sickle	4·45	12·11	0·71	1·42	14·24	..	7 12 6	Cuming, Smith, and Co., Melbourne
Citrus, Mildura, No. 2 ..	"	2·02	5·52	0·32	11·45	17·29	..	5 17 6	" " " "
Grass (Top Dressing) ..	"	0·77	16·15	0·95	1·90	19·00	..	5 5 0	" " " "
Rape	"	2·00	13·00	0·76	2·52	16·28	..	5 10 0	" " " "
Vine, No. 2, Mildura ..	"	7·13	9·18	0·54	1·08	10·80	..	9 7 6	" " " "
Vine, No. 4, Mildura ..	"	9·20	9·18	0·54	1·08	10·80	..	10 0 0	" " " "
Rape	Hasell's	1·20	14·25	1·00	2·25	17·50	..	5 7 6	A. H. Hasell, Melbourne
A. and P., No. 2, Mildura	M.L.	5·75	12·11	0·71	1·42	14·24	..	8 0 0	Mt. Lyell M. and R. Co., Melbourne
Citrus, No. 2, Mildura ..	"	2·02	5·54	0·33	11·43	17·30	..	5 17 6	" " " "
Vine, No. 2, Mildura ..	"	7·13	9·18	0·54	1·08	10·80	..	9 7 6	" " " "
Vine, No. 4, Mildura ..	"	9·20	9·18	0·54	1·08	10·80	..	10 0 0	" " " "
Containing Phosphoric Acid only, difficultly soluble.									
Ground Phosphate, 80%	Federal G.P. ..	..	..	..	36·65	36·65	..	5 0 0	Australian Explosives and Chemical Co., Melbourne
" "	Sickle	..	..	..	36·65	36·65	..	5 0 0	Cuming, Smith, and Co., Melbourne
Ground Rock Phosphate 60%	Hasell's	..	..	..	27·50	27·50	..	3 15 0	A. H. Hasell, Melbourne
Ground Phosphate, 50%	M.L.	..	..	..	23·00	23·00	..	3 10 0	Mt. Lyell M. and R. Co., Melbourne
Ground Phosphate, 80%	"	..	..	..	36·65	36·65	..	5 0 0	" " " "
" " "	Wischer and Co. ..	..	..	..	36·50	36·50	..	5 0 0	Wischer and Co., Melbourne
Victoria Phosphate, No. 2	Victoria Phosphate, No. 2	..	..	2·00	13·00	15·00	..	2 10 0	T. O. Wolskel, South Melbourne
Victoria Phosphate, No. 1	Victoria Phosphate, No. 1	..	..	3·00	14·00	17·00	..	2 16 0	" "

List of Fertilizers Registered at the Office of the Secretary for Agriculture under the Artificial Manures Acts—*continued*.

Description of Manure.	Brand.	Nitrogen.	*Phosphoric* Acid.	Mechanical Condition.		Price asked for the Manure per ton.	Where Obtainable.
				Fine.	Coarse.		
Containing Nitrogen and Phosphoric Acid moderately soluble —High Grade.		%	%	%	%	£ s. d.	
Bonemeal	Sickle	3·00	19·00	30·00	70·00	7 0 0	Cuming, Smith, and Co., Melbourne
Bonedust	J.N.D.B. ..	4·23	20·87	33·00	67·00	6 0 0	J. N. Day, Bendigo
"	Hasell's	4·40	19·00	55·00	45·00	7 5 0	A. H. Hasell, Melbourne
"	Vauxhall ..	3·86	23·25	33·70	66·30	6 15 0	Wm. Moore, Panmure
Bonemeal	M.L.	3·00	19·00	30·00	70·00	7 0 0	Mt. Lyell M. and R. Co., Melbourne
"	Rohs	4·00	18·00	55·00	45·00	6 0 0	P. Rohs, Bendigo
"	Marvel	3·74	23·62	36·00	64·00	6 10 0	Spriggs and Porter, Benalla
"	Lion	3·85	21·50	31·00	69·00	6 10 0	A. Wray, Sale

REMINDERS FOR THOSE BUYING ARTIFICIAL FERTILIZERS.

By W. C. Robertson, Supervising Analyst.

Don't purchase artificial fertilizers of low grade, *for you are only paying freight on the "filler."*

Don't take delivery of any artificial manure without an invoice certificate. This is your safeguard.

Don't take delivery of unlabelled or unbranded bags of fertilizer.

Don't be satisfied unless you receive the manure you order. When ordering bonedust do not accept bone fertilizer.

Don't pay a higher price than the registered price per ton, plus freight. The Fertilizer Acts regulate the price at which any given manure can be sold.

Don't be dissatisfied should you weigh *several bags of fertilizer and find them several pounds lighter than the guaranteed weight. Artificial fertilizers, especially superphosphate, contain water, and this, in transit, often dries out.*

Don't worry over a "sticky" manure, or try to force it through the drill. It is better to immediately dry the manure by mixing with a proportion of dry sand or earth.

Don't think that the various brands of superphosphate vary in plant foods. Superphosphate is a simple manure supplying phosphoric acid only, and although different brands may vary in the amount of phosphoric acid they contain, *you are wrong if you assume that different brands of "super.," under like conditions, will act differently on the same soil.*

Don't forget to experiment, especially in the quantity of manure sown per acre. Departmental experiments during last year proved a dressing of 75 lbs. of "super." more profitable than 56 lbs.

Don't mix artificial manures haphazardly. In this connexion, unless experienced, always seek expert advice.

Don't buy a larger quantity of manure than you intend to use. There is sure to be trouble with the bags, and, furthermore, fertilizers, unlike wine, do not improve with age.

Don't allow bags of *artificial fertilizers to get wet. Some fertilizers are extremely soluble, and the loss would be appreciable. Then, again, there is always the danger of trouble from lumps when drilling and the bursting of bags after drying.*

Don't forget that artificial fertilizers do best on well tilled soil.

Don't think that the cereal crop is the only one on the farm which requires manuring. Even should your grass lands be eminently satisfactory, the trees in the orchard may respond to a dressing of fertilizer.

Don't waste the fowl and farmyard manure. Both are, "diluted," complete fertilizers, and, when well dried, are worth at least 5s. per ton in the open market, and worth considerably more on the farm. Remember their humus content.

Don't sell bones off *your own farm at £3 per ton and buy them back in the form of bonedust at £6 10s. per ton. Distribute them over the* "home" paddock; they will slowly decompose, thereby equalling a bonedust dressing.

Don't attempt to build up your soil with highly-priced "mixed" manures. The only successful method combines a good rotation, with green manuring, and the application of simple manures.

Don't discard sodium nitrate. A bag or two spread broadcast on the growing crop in the spring often proves a profitable transaction.

Don't forget that a careful system of tillage, together with a good rotation, will ultimately become important factors in the matter of manure bill and bank balance.

Don't leave small amounts of artificial manure in your drill between seasons. The drill should be carefully cleaned ere it is put away.

THE RESERVE SUPPLY OF PHOSPHATE ROCK IN THE UNITED STATES.

The Bureau of Soils, Washington, publishes the result of investigation into rock phosphate resources in U.S.A.

W. H. Waggaman was the investigator, and he estimates that 10,519,875,000 tons of rock phosphate of various grades is available. Giving the production in 1912 as approximately 3,000,000 tons, the author calculates that developed rock phosphate will last for over 1,100 years.

Whilst stating that the value of the material as a fertilizer still remains an open question, the author remarks that the sale and use of raw ground rock phosphate for direct application to the field is increasing.—*Journal Industrial and Engineering Chemistry*, June, 1914.

The raw rock phosphate used to furnish superphosphate to Australian agriculturists is mainly obtained from Ocean, Christmas, and Malden Islands. As the fields are privately owned or leased no figures are available as to the tonnage developed for the future use of the Australian farmer

Very little, if any, of the raw ground rock is used as a fertilizer in Australia.

ACCORDING to Dr. Myers, the delegate for the Chilian Nitrate Committee in the United States of America:—"The beet sugar production of the United States for the year 1913 was the largest on record, amounting to 773,000 tons (of 2,000 lbs.) of sugar. The area under cultivation was 580,000 acres, the average yield being 2,500 lbs. of refined sugar per acre of beets, each ton of beets yielding about 250 lbs. of refined sugar. There were seventy-one factories in operation during 1913-14 season, and the industry is confined mostly to the Western States, except Michigan and Ohio."

THE MELBOURNE UNIVERSITY VETERINARY SCHOOL.

Historical.

The teaching of veterinary science in Australia had its inception in the establishment by Dr. W. T. Kendall, of the Melbourne Veterinary College, at Fitzroy, Melbourne, in the year 1888. The following year the *Veterinary Surgeons Act* was placed on the statute-book of the State of Victoria, and the new school was later recognised as a teaching institution by the Board established under the provisions of that Act. Although entirely a private institution in that it received no support from any public body, or funds, it is worthy of permanent record that it was the first Veterinary College in the world to establish a four years' course in veterinary science as a necessary qualification for a diploma.

For many years it was obvious to those who were interested in veterinary training and veterinary science that such an institution was deserving of very considerable public support, and that it should be placed on a permanent and satisfactory basis.

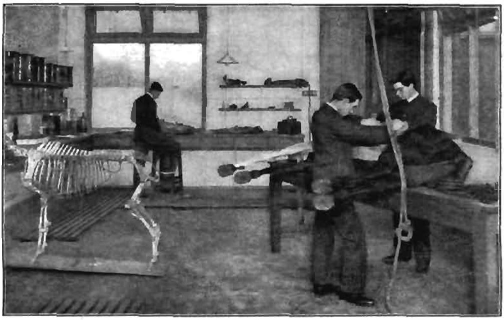
The Veterinary Research Institute.

In 1906 a joint committee of representatives of the Government and of the University was established for the purpose of inquiring into the whole position, and, as a result of its investigations, the Government agreed to provide the funds necessary for the erection and equipment of a thoroughly up-to-date Veterinary School, with adequate endowment, and the University decided to establish degrees and diplomas in veterinary science, while Dr. Kendall generously accepted the proposal to transfer his own services and the students attending his College to the University. That the City of Melbourne was equally enthusiastic in its approval of the proposal was shown by the graceful and generous offer of a valuable and very convenient portion of land adjacent to the University as a site for the new institution.

These various proposals received the sanction of Parliament early in 1909 by the enactment of the *University Act* 1909, and veterinary teaching in Australia entered on a new *régime* at the commencement of the University session of that year.

THE GROUNDS.

Comprising 4 acres of valuable land, given by the Melbourne City Council to the University for this special purpose, the grounds are



The Dissecting Room.

"Searching a Foot."

bounded on three sides by broad public streets. The main frontage is on Flemington-road, from which the land rises to a much higher level facing Storey-street. The main entrance gates are at the corner of

Flemington-road and Park-street, within three minutes' walk of Sydney-road tramway line, while a side entrance into Storey-street affords a shorter route to the main University buildings adjacent. Planted and laid out according to a design kindly prepared by Mr. W. R. Guilfoyle, late Director of the Botanical Gardens, Melbourne, they, together with the various buildings, present a fine appearance when viewed from the gateway.

The buildings comprise the research and anatomy block, the hospital quadrangle, and the Cuming operating theatre, with surgical ward.

THE TEACHING OF STUDENTS.

To become a veterinary surgeon it is necessary for a student to have a good preliminary education, and he must pass one of the Public Examinations in the required subjects before being allowed to matriculate

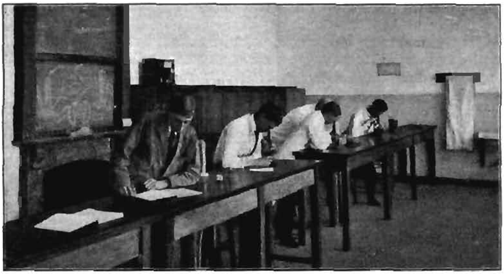
Dispensing in the Pharmacy.

at the University. The veterinary course is one of four years' duration, and during the first year the student receives his education in the preliminary sciences of chemistry, botany, zoology, and physics. These are essential for a proper understanding of the more professional subjects, and in order that a veterinary graduate may rightly claim to be a scientifically educated man.

At the same time a beginning is made in the professional work by requiring the first year student to attend practical classes on stable management and demonstrations on the bones and joints of the domesticated animals.

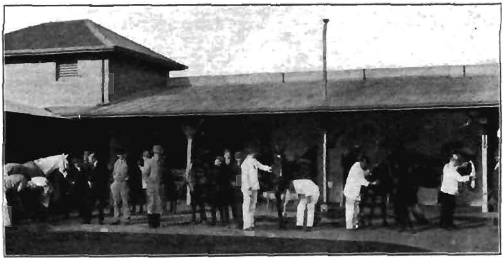
Having successfully passed the subjects of the first year, the student proceeds in his second session to learn anatomy and physiology. To get a good knowledge of the structure and usefulness of a machine one

must see it at work and study the action and effect of each part, then take it to pieces, and build it up again. The living animal body is something more than a machine, but physiology and anatomy attempt to elucidate the structure, general and minute, and the function of each part of the body.



The Students' Laboratory.

Anatomy is best learned by means of careful dissection of all parts of the body, revealing and tracing out arteries, veins, and nerves; noting the relative positions of various organs, and making such a detailed survey of the body that the surgeon when operating shall have an intimate knowledge of his whereabouts, and so be able to achieve his object without serious damage to vulnerable structures in the vicinity.



Patients being Examined.

Physiology is a fascinating science, and is an answer, so far as human knowledge can supply one concerning the animal body, to the question, "How does it work?" This subject is taught in the physiology department of the medical school of the University.

But whilst physiology and anatomy occupy most attention in the second year, the student is also required to give some time to a continuation of the practical course in stable management, to lectures on horse-shoeing, and to instruction in the preparation and dispensing of the various drugs used in veterinary medicine. At the end of the second year the student takes his second examination.

In the third year the study of disease, its nature, causes, and treatment, really begins; having learnt something of the normal, the study of the abnormal can be commenced. The chief subject of the year is pathology and bacteriology. In the *post-mortem* room the gross changes produced by different diseases can be seen, and then the diseased parts can be subjected to microscopic examination for an elucidation of the detailed changes which have occurred. Further, it is of supreme importance to determine the cause of the disease, and in this connexion bacteriology and parasitology are studied. Many of the most serious animal diseases, such as anthrax and tuberculosis, are due

Canine Patients.

to bacteria—minute vegetable organisms allied to the fungi—and most of the advances of modern medicine and surgery have resulted from a study of the habits and characters of these microbes, a study established as a science by the untiring efforts and brilliant achievements of Pasteur, Lister, and Koch.

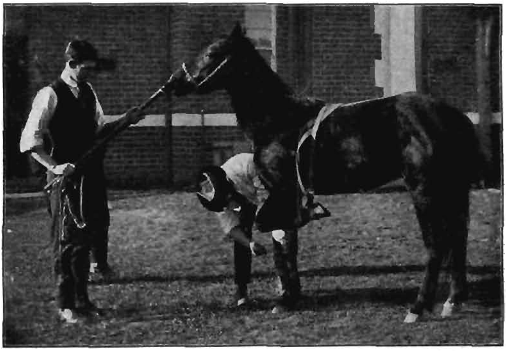
Even more recently investigations of disease have shown the extremely serious effects of animal parasites as casual agents and transmitters of disease. Mention need only be made of malaria in man transmited by mosquitoes, and red water or tick fever of cattle transmitted by ticks.

For a proper study of these subjects well-fitted laboratories are essential, and generous provision has been made for this in the school. The student has opportunities, not exceeded in any veterinary school, for obtaining a practical acquaintance with the appearances, habits, and methods of detection of these organisms, animal and vegetable, which cause disease, and of the means whereby they may be controlled or eradicated.

In this (third) year, too, hospital practice is commenced. The school has a large clinic, or out-patients hospital practice, to which persons unable to pay for professional attendance may bring their sick animals. About 1,500 cases are seen during the course of the school year, and the medicines supplied are dispensed mainly by students in the third year.

The "Cuming" Operating Theatre.

Another subject of considerable importance is that of hygiene and dietetics. Proper feeding of animals is of great importance in the prevention of disease, and the economic feeding of horses for work, and of cattle and sheep for the production of meat and milk, is essential for financial success. The laws of health in relation to the construction of



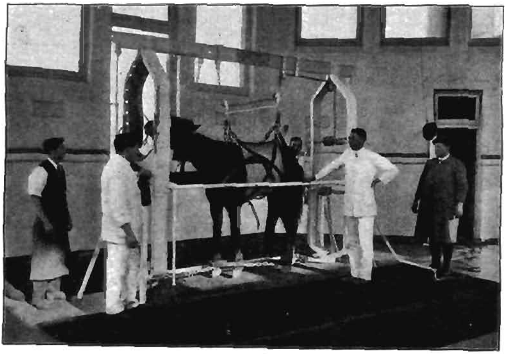
Probing a Wound.

stables, cow-sheds, their drainage, the water supply, and other similar matters are taught in this course. Animal conformation and the types for special purposes are studied both in the field and by means of lantern slides, whilst practical horse-shoeing finds a place in the work of the year. At the end of the year comes the third examination.

In the fourth year all the emphasis is on practical work. Medicine, surgery, and obstetrics are the main subjects, and hospital practice, and laboratory methods of diagnosis occupy a large part of the time. In connexion with the clinic is a hospital for in-patients capable of accommodating about twenty horses or cattle and fifty dogs. Suitable cases are selected from among the out-patients, and are kept in hospital for treatment or observation at a charge which covers cost of keep only.

For surgical operations, the facilities are extremely good. There is a spacious theatre, with a large horse operating table, a small operating room for dogs, and a good supply of instruments. All the important operations are performed under anæsthesia, chloroform, morphine, and cocaine being the chief anæsthetics employed.

With regard to medicine, the observation of symptoms and physical signs of disease is only possible when in-patients can be obtained, and



A Horse in the Operating Table.

the amount of experience gained in the school hospital is of the highest value for the subsequent practice of veterinary medicine.

Obstetrics is a branch of veterinary science which can only be learned satisfactorily as a result of experience in the country, in the foaling or calving season. At the same time, by means of specimens and diagrams, the general methods to be adopted and the use of instruments is taught, so that experience may be gained on right lines.

At the end of the fourth year the student proceeds to his final or qualifying examination, and, if successful, receives either the degree, Bachelor of Veterinary Science, or the licence, L.V.Sc., depending on whether he has matriculated or not. Both qualifications are accepted by the Veterinary Board of Victoria as qualifying for registration.

If the student is desirous of obtaining further distinctions, he may proceed to the degrees of Master and of Doctor of Veterinary Science in due course.

INVESTIGATION OF DISEASE.

In addition to the purely teaching work, the school is equipped as a Research Institution for the investigation of animal diseases. In a quadrangle adjoining the pathological laboratory are boxes for experimental animals, and these can be kept under close observation. In the case of an outbreak of some unknown or little understood disease, affected animals can be brought here, and the actual causation of the disease, together with methods of diagnosis, treatment, or prevention worked out, if possible. A convenient *post-mortem* room, and an incinerator for the destruction of any infectious material or dead bodies complete the quadrangle.

Operation on a Dog, under Chloroform.

THE OUTLOOK.

It is well to know that the Commonwealth and State Governments are employing more veterinary surgeons every year, and, as in other parts of the world, the services of scientifically trained veterinarians are being valued more and more highly, not so much in the treatment as in the prevention of contagious animal diseases.

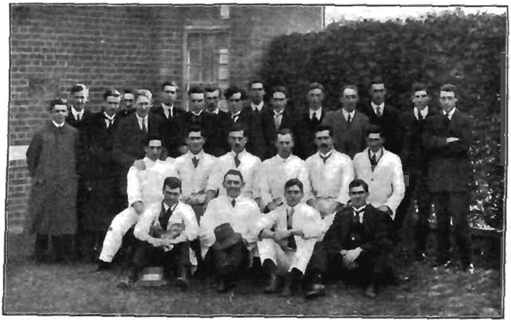
In Victoria, in addition to the duty of administering the Stock Diseases Act, dealing with the notifiable contagious diseases of animals, the veterinary department is intrusted with the highly important work of the supervision of dairy cows and of the examination of stallions for the Government certificate.

Veterinary surgeons, too, are everywhere recognised as the fit and proper persons to have charge of meat inspection, and this duty is a highly important one in a meat exporting country like Australia.

The Army Veterinary Service bids fair to be an attractive one to the right kind of man, and how important it is to the State may be realized when no less than ten graduates from this school have received commissions as veterinary officers in the Australian Expeditionary Forces.

The Research Laboratory.

Private practice is not to be despised, and there are numbers of districts in Victoria where a veterinary surgeon is badly wanted. To a man about to farm land of his own, especially if interested in stock raising or horse breeding, the possession of a veterinary degree is a great



A Group of Veterinary Students, 1914.

asset, and four years spent in obtaining a degree at the University Veterinary School will not only supply this extremely useful knowledge, but will broaden his outlook and entitle him to be considered a scientifically educated man.

MILKING MACHINES IN VICTORIA.*

By R. T. Archer, Senior Dairy Inspector.

There are about fourteen different makes of milking machines in this State, and, as far as can be ascertained, 2,000 farmers have been supplied with machines or pulsators. Some of these have been put out of use for various reasons considered below. One of the principal advantages in connexion with machines is that it renders a farmer practically independent of labour, which is a difficult problem in this country.

When the machines are properly handled by those who take an interest in them, the results are thoroughly satisfactory. Especially is this the case with heifers first broken in to the machine. It is found also that the milk keeps satisfactorily. That this should be the case with proper handling is proved by the experience at the Talbot Institute for the supply of pure milk for infant feeding. On the other hand it is difficult, almost impossible, to persuade the average dairy-farmer to exercise the necessary care in cleansing the machines, and when this is neglected the quality of the produce suffers.

TYPES OF MACHINE.

All the machines but one in use in this State are worked on the vacuum principle. The vacuum is produced either by pump or a steam ejector. The pump is the more economical except where there is an abundance of cheap fuel.

The systems in use are the bucket and the releaser, conduit, pipe or tank system, as it is variously called. The bucket system consists of covered buckets, into which the milk is conveyed through tubes direct from the cows' teats. In the pipe system the milk is conveyed from the teats through pipes to a tank in any convenient place. The latter is a very convenient system, but the pipes become an additional menace in careless hands. They are of brass or gun metal, with polished surface inside. Experiments have been made with strong, clear glass tubes to replace the metal, and it is easy to see if these are clean. It is the intention of one firm to exhibit these in use at the forthcoming Royal Agricultural Show. Various valve devices are used to provide automatic release of the milk, so that the vacuum may be sustained. In this State comparatively few of the machines are worked on the latter system, but in New Zealand a great number are in use, and are a great source of trouble to the managers of cheese and butter factories there.

Another type of apparatus used for milking, which, on account of its apparent cheapness and simplicity, is likely to find favour with the uninitiated, consists of four ordinary milk tubes or teat syphons with

* Paper read before the British Association for the Advancement of Science, Melbourne, 1914.

rubber tubes attached to convey the milk to the buckets. Of course users of these appliances run a very big risk of introducing septic bacteria.

EFFECT OF THE MACHINES ON THE COWS.

Many reliable authorities claim that cows milked with machines rarely have sore teats, and those that have rapidly heal, and do not bleed, as they do when milked by hand. Some claim that contagious mammitis is more likely to spread with machines, but this only applies to the careless man, and requires the necessary sanitary precautions; the use of disinfectants will prevent the spread of disease. There is no proof that the yield of milk is detrimentally affected. Several large dairymen have now been using the machines for ten or twelve years, and are satisfied with their experience. Some consider it a fault that the machines do not milk the cows dry, and try to do so by manipulation in various ways. I think it is more beneficial than otherwise that it is necessary to strip by hand, as the udder is subjected to a massaging which increases the circulation and prevents atrophy.

COST OF UPKEEP.

This varies with the construction of the machine and the care bestowed upon it; but under proper treatment it may be put down about £1 per single machine per annum. Aluminium is largely used in the teat cups, and many of these appear to corrode rapidly at the top and bottom. Some attribute this to the milk not being properly cleaned off, but it is more probably due to the soda used in cleansing. It is questionable if aluminium is the most suitable for this purpose. Light gun metal or brass cups nickel plated appear to stand better. During the past season an all-metal teat cup was used in a large dairy with very satisfactory results, both from a mechanical and a sanitary point of view. As this largely reduces the amount of rubber required, it should be much cheaper to maintain.

THE SANITARY ASPECT.

The greatest problem in connexion with the milking machine as it presents itself in this country is with regard to sanitation. The difficulty is to impress users with the necessity for properly cleansing the machines as soon as possible and before the milk has time to dry. The experience gained through the Lady Talbot Institute goes to prove that with proper care milk can be produced giving an exceptionally low bacterial count.

Table showing Number of Micro-organisms per Cubic Centimetre.

	1911.	1912.	1913.	1914.
ebruary	9,000	5,300	39,700	18,700
arch	29,600	21,200	58,400	5,600
pril	25,400	31,300	60,000	6,600
Average	21,333	19,266	52,700	10,300

Table showing average of micro-organisms per cubic centimetre after deleting the figures for the sample yielding the highest count each month. (This table gives a better idea of the bacterial condition of the bulk milk supplied by the institute.)

	1911.	1912	1913.	1914.
February	4,400	2,500	13,000	10,400
March	14,500	4,100	34,500	5,000
April	20,600	8,000	35,000	6,100
Average	13,166	4,866	27,500	7,166

For December, 1913, to April, 1914, the average count was 9,780. After deleting the highest count each month the average was 5,380. It must be borne in mind that these counts are the results of bacterial examination, obtained from milk delivered in the ordinary way many hours after milking.

Milking at the Talbot Farm.

In the summer of 1911 Mr. Norman McDonald, B.V.Sc., conducted an investigation into machine and hand-drawn milk to determine the relative bacterial content. This investigation was conducted at the farm from which the milk was obtained by the Lady Talbot Institute. This is a charitable organization instituted for the special purpose of providing infants with a pure milk supply from healthy, tuberculin-tested cows. At this farm the milking machines were in use, and the institute desired to have a comparative test made of both methods, the test to continue for the summer months. The farm was under the constant supervision and immediate control of a Government dairy supervisor, the circumstances were such as to render possible a complete comparative test of the two methods, working side by side, and under the very best conditions practicable.

The number of cows milked daily throughout the season averaged ninety-five, chiefly of the Ayrshire type, all having undergone veterinary inspection and the tuberculin test. They were kept in good condition, well fed and groomed twice daily, stalled at night, and during the day turned out into an area of about 20 acres, for exercise.

Food Supply.

The cows were fed mainly on fodder crops grown on the farm, with the addition of bran and a limited quantity of brewer's grains. Any food likely to be detrimental to the milk supply was guarded against, and no feeding allowed in the milking shed, but given to the cows immediately after milking.

Milking Methods.

The milking had been done throughout the season with three L.K.G. milking machines. Before the machines were applied, the milk of each cow was carefully examined by the supervisor, a small quantity being

drawn from each teat for the purpose, as a check against milk being used from injured udders, and also as a means of detecting the symptoms of any of the various diseases of the udder affecting the milk supply. *These precautions were taken daily throughout the season.* The fore-milk, *about four streams from each teat, was then taken, and the teats and udders were carefully washed with warm water, clean water being* used for each pair of cows. The machines were *then applied, and after* removal the cows were stripped out by hand into special buckets with cotton wool strainers fitted into the mouth. The milk, after being weighed, was passed through a cleansing centrifuge, and thence over the refrigerator, and the temperature reduced to 40 degrees Fahr., and immediately bottled, sealed, and dated, placed in crates, packed in ice, and delivered to the distributing agents within four hours after being milked, every caution being taken during the whole process to insure cleanliness. All utensils, milk bottles, and everything coming in contact with the milk, were sterilized twice daily. All teatcups and rubberware in connexion with the milking machines were boiled twice daily in soda *water ½ per cent. strength, left in the sterile water between milkings, and immediately before being used were blown out with dry steam. The machines were also sterilized at intervals during the milking opera-*tions by being placed in boiling water and soda *after* each machine had milked a pair of cows, opportunity being taken for this work in the interval during which the bails were hosed down and a fresh section of the herd brought in. The process of sterilizing the milking machines received special attention by the supervisor through the season. All the employés at the dairy were provided with a clean suit of overalls and cap for each milking, and received instructions from the supervisor throughout the season on sanitary methods in the production and handling of milk for infants, the same staff being employed right throughout the season.

Sources of Contamination.

In hand-drawn milk the chief sources of contamination are—

1. The milker's hands, and, to some extent, his garments. In many cases there is no doubt that such are very important factors, especially where the method known as wet milking is pursued.

2. The skin of the cow, particularly that covering the udder and teats. This is a common source of infection, for often no precautions are taken in regard to thorough washing of the udder and grooming of the flank, consequently scurf, &c., frequently enter the pail.

3. Atmospheric dust and manure particles falling into the bucket during and subsequent to the process of milking.

4. The milk in the teat duct. It is well known that the first milk invariably shows a much larger bacterial content than the average milk, due to invasion by bacteria through the orifice of the teat duct between milkings.

In the machine the chief sources of contamination are likely to be—

1. The surface of the teat which is being intermittently washed by the milk as withdrawn.
2. Air drawn into the cup at each pulsation through the small "air admission" aperture.
3. Bacteria within the teat duct.
4. Dirt within the apparatus itself.

In conducting these investigations an endeavour was made to eliminate as far as practicable each and all of these sources of contamination in both the hand and machine milking.

For the purpose of the comparative test, four cows were selected, all being approximately of the same age, breed, and condition, and each giving about the same quantity of milk. Two were carefully milked by hand and two by machine. Fair samples from the total supply of each pair were placed, by the supervisor, in sterile bottles, securely stoppered and immediately cooled to about 40 degrees Fahr. These bottles, each containing a pint, were retained at a low temperature until delivery at the laboratory, where they were placed in an ice chest until tested.

The tests were conducted during January, February, March, and April. During April, owing probably to the cooler weather, a marked general decrease in the bacterial content of both milks was experienced, the total number in each often falling below 250 per cubic centimetre. For this reason the counts obtained in April have not been included in working out the averages given below.

Throughout the test the appearance and palatableness of both milks were excellent, no taint or odour ever being detected, and the bottles on standing showed a good layer of cream. In regard to ordinary keeping qualities, the milk, when kept in the ice chest at about 50 degrees Fahr., invariably remained perfectly sweet and wholesome for at least forty-eight hours after milking, even during the hottest summer months.

GENERAL BACTERIOLOGICAL RESULTS.

Throughout the period under review the average number of bacteria present per cubic centimetre was, in the hand milk, 7,500, and in the machine milk 6,750. Naturally there was often a decided difference between the bacterial content of the two samples. For example, it was found that on twenty-five occasions the hand milk contained at least twice the number of bacteria present in the machine milk, while on twelve days the machine showed at least double the number found in the hand milk.

For the first six weeks the strippings of the two machine-milked cows were added to the bulk before the sample for examination was secured. Subsequently, however, this practice was discontinued, it being considered that such a method was really not fair either to the hand or the machine, as, of course, the strippings were removed by hand.

That the removal of the strippings by hand and their subsequent addition to the machine milk seemed to deteriorate the latter from the stand-point of bacterial purity is indicated by the following figures. During the period when this practice was adopted, the hand milk showed

5,000 bacteria per cubic centimetre, and the machine milk showed 10,750 bacteria as daily average; but during the following period when no strippings were added to the machine-drawn milk, the average figures were 9,500 for the hand, and but 3,500 for the machine.

It must not be understood, however, that any definite and absolute conclusion can be drawn from these figures, for, as a matter of fact, it is seen that, during the first half of the first period, the average tests were much more approximate than during the second half.

BACTERIA ISOLATED.

For the first few weeks the nature of the different bacteria found in the plates was carefully ascertained by subcultures on different media. It was found that both the species and the relative number of each species varied so greatly that any results of scientific value could not be expected from pursuing this work further. In regard thereto, it is sufficient to state that, in addition to the ordinary bacteria inducing lactic acid fermentation, cocci (particularly staphylococci) and sarcinæ were common, while streptococcus was comparatively rare. Various forms of saccharomyces were frequently encountered. The colon bacillus was not common, and the liquefying bacilli present were those commonly found in water.

A number of doubtful organisms were tested as to their pathogenicity on laboratory animals, but in no instance were the results fatal, and rarely was a passing inflammation produced.

RESULTS OF INVESTIGATION.

The results of the above investigations have demonstrated the following points:—

1. That, provided the apparatus of the milking machine is intelligently handled, and that it is thoroughly attended to as regards cleanliness and sterilization, its use does not interfere with the general health of the cow or of the udder.
2. That the milking machine so used does not lead to a greater bacterial contamination of the milk than does the process of hand milking, even when conducted under the most approved conditions; but that, on the contrary, the average results show an improvement.

Mr. McDonald says:—"In common with others I have, however, noted in general practice that such pathological conditions as streptococcic mammitis, a common contagious disease of dairy cows, is much more readily spread by the milking machine than by hand. As such a catastrophe can be readily obviated by a routine examination of each cow's udder prior to milking, a practice generally adopted by progressive dairymen, its occurrence should not be attributed to the machine alone, but to the carelessness or ignorance of its owner.

"Given, therefore, the adoption of such precautions as are well within the compass of all dairymen, there appears to be no reason for anticipating any danger to the milking industry through the extension of the employment of such apparatus as approved milking machines when employed with due regard to their cleanliness and sterilization."

Details of Examination.

The following tables show the results of each day's examination of the hand and machine-drawn milks:—

Date.	Hours before Plating.	Hand.		Machine.	
		Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.	Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.
1911.					
Jan. 3 ..	13	59	4,000	59	3,750
4 ..	10	66	6,000	67	5,750
5 ..	9	75	3,000	76	10,000
6 ..	27	66	5,250	66	3,250
7 ..	9	71	4,500	71	5,000
9 ..	27	71	4,500	75	10,500
10 ..	9	73	10,750	73	3,750
11 ..	9	64	2,000	64	3,750
12 ..	8	64	3,000	65	2,750
19 ..	8	59	4,250	59	4,000
21 ..	28	57	3,500	57	2,250
23 ..	8	69	3,250	73	2,750
26 ..	10	74	1,500	74	1,250
27 ..	8	70	2,250	69	4,000
28 ..	27	60	3,500	60	2,000
30 ..	18	60	2,000	60	1,750
31 ..	18	60	1,500	60	7,250
Feb. 1 ..	18	55	2,750	55	13,780
2 ..	18	55	1,250	55	9,250
5 ..	18	53	1,750	55	6,750
6 ..	18	51	5,250	51	137,000
7 ..	18	53	9,000	54	1,500
8 ..	18	51	12,000	50	33,750
9 ..	18	50	3,500	59	8,500
10 ..	18	49	11,250	47	1,000
12 ..	18	51	24,000	51	11,500
13 ..	18	47	3,800	46	7,250
14 ..	18	51	9,000	51	1,500
15 ..	18	51	6,750	55	10,750
17 ..	18	51	1,250	55	2,500
20 ..	18	60	58,500	59	3,500
21 ..	18	55	3,500	55	1,000
22 ..	18	55	6,500	71	4,000
23 ..	18	55	15,250	59	5,000
24 ..	18	49	7,000	51	3,500
26 ..	18	49	2,500	51	3,250
27 ..	18	55	7,000	55	1,000
28 ..	18	54	9,000	53	15,500
March 1 ..	18	56	15,500	56	4,000
2 ..	18	56	7,000	56	500
3 ..	18	58	10,000	53	2,500
5 ..	18	59	2,500	62	750
6 ..	18	57	5,750	59	500
7 ..	18	55	22,500	59	1,500
8 ..	18	53	23,250	55	3,000
9 ..	18	51	8,250	55	500
10 ..	18	54	11,250	52	1,000
12 ..	18	59	4,750	59	1,500
13 ..	18	59	7,000	58	6,500
14 ..	18	55	4,000	53	2,000
15 ..	18	50	4,500	51	1,250
16 ..	18	55	5,000	51	2,750

DETAILS OF EXAMINATION—*continued.*

Date.	Hours before Plating.	Hand.		Machine.	
		Temp. of Milk. Degrees. Fahr.	No. of Bacteria per cubic centimetre.	Temp. of Milk. Degrees Fahr.	No. of Bacteria per cubic centimetre.
1914.					
March 17 ..	18	54	5,000	51	3,950
19 ..	18	55	5,500	55	1,000
20 ..	18	59	79,750	55	80,000
21 ..	18	53	2,500	50	4,750
23 ..	18	53	14,750	52	6,250
24 ..	18	57	15,000	57	3,250
26 ..	18	48	8,250	46	15,500
28 ..	18	46	11,250	50	8,750
31 ..	18	49	1,250	45	500
April 2 ..	18	15	5,000	59	750
3 ..	18	67	1,000	65	250
4 ..	18	56	250	57	1,250
5 ..	18	22	500	55	5,000
6 ..	18	52	*	53	*
7 ..	18	53	500	56	26,000
9 ..	18	51	*	49	1,250
10 ..	18	50	*	51	6,000
11 ..	18	49	250	49	*
12 ..	18	47	250	47	2,250
17 ..	18	56	*	57	*
18 ..	18	52	*	52	*
19 ..	18	50	*	50	*
20 ..	18	44	5,000	44	*
21 ..	18	46	5,750	47	250
24 ..	18	50	1,800	49	1,250
25 ..	18	48	1,400	49	2,400
26 ..	18	52	2,250	52	1,000
27 ..	18	52	4,500	52	500
28 ..	18	52	6,000	52	3,250

* Means less than 250 bacteria per cubic centimetre.

NOTES ON TABLES.

1. From 3rd January to 28th January the samples were taken from the morning milk.

2. From 30th January to 28th April the samples were taken from the evening milk.

3. From 3rd January to 14th February the machine milk was taken with the addition of the strippings drawn by hand.

4. From 15th February to 28th April the machine milk was taken without the addition of strippings.

5. From 15th February to 20th March the machines were used on test cows, immediately after removal of sterile solutions.

6. From 5th March to 28th April the milk was delivered in ice chest as despatched from farm and without re-packing.

7. From 21st March to 28th April the machines were used on test cows, after having previously milked ten cows.

8. From 9th April to 28th April, the cows were transposed as to method of milking.

On 28th March it was ascertained that the excessive high count was due to a particular batch of bottles not being properly sterilized.

RUTHERGLEN EXPERIMENT FARM.

SURVEY OF THE COMMONER WEEDS.

(Continued from page 346, Vol. XII.)

By G. H. Adcock, F.L.S., Principal, Viticultural College.

PART 2.

II.—LOCAL WEEDS PROCLAIMED FOR SOME PORTION OF THE STATE.

**Acacia armata.* R. Brown. Kangaroo Acacia. Order, Leguminosæ: The pod-bearing family. The generic name is from the Greek, and indicates that the plants on which the name was bestowed were spiny. The armed reference in the second name refers to the prickles. This is a native plant extensively used a generation ago for hedges, but going out of favour. It requires a vast amount of attention, and in case of fires the green foliage will burn fiercely.

**Cryptostemma calendulacea.* R. Brown. Cape Weed. Order, Compositæ: The Daisy family. The derivation is from Greek *kryptos*, concealed; *stemma*, a crown. The scaly crown of seeds is concealed in wool. The specific name compares this plant with the marigold.

This South African native has come to us *viâ* our western neighbours. It is a variable plant, prostrate in habit with succulent branches. The leaves are downy beneath. The flowers are large and golden, with dark centre. Where plentiful it gives quite a yellow appearance to the field during flowering. As it seeds freely it spreads rapidly and grows luxuriantly in spring, but dies out and leaves the ground bare on the first approach of heat. A few graziers speak well of its food value. But it unquestionably usurps the space of a better and more lasting growth. It also communicates an unpleasant taint to milk. Like other exuberant, succulent green feed, it is likely to cause trouble when hungry stock are allowed to gorge.

**Cucumis myriocarpus.* Naudin. Gooseberry cucumber. Occasionally called paddymelon, a name more properly applied to a kind of wallaby. Order, Curcurbitaceæ. *Cucumis* is Latin for cucumber, probably from *Curvus* from the shape of fruits. The specific name refers to the number of fruits borne on each plant. This is a trailing plant easily recognised by the gooseberry-shaped, bristly, and often striped fruits. As it seeds freely it is troublesome, but being an annual is easily coped with if seeding is prevented. A native of Cape Colony, this plant early earned in Australia a bad name for being the alleged cause of blindness, and even the death, of horses that acquire the habit of eating it. In the January, 1914, issue of the New South Wales *Agricultural Gazette*, is an account of some experiments with this plant, conducted by Dr. Cleland, Microbiologist. A calf was drenched with various quantities of these fruits up till finally 100 per day for three consecutive days were given without any ill effects. The plant emits a musky odour when tramped on or bruised.

**Erysimum repandum.* L. Treacle mustard. Order, Cruciferæ: The Cabbage family. The name of the genus is from the Greek *eryo*, to draw,

and refers to its former use in poultices; *repandum*, bent back or turned up (*Latin*), refers to the curve of seed vessels. This is a robust plant from the Mediterranean region. It has branched stems, yellow flowers, and long, bent, beaked fruits. With us it has a predilection for waste places, along hedges and fences. The popular name was given because one plant of this genus was formerly used as an ingredient of Venice treacle.

**Marrubium vulgare*. L. Horehound. Order, Labiatæ: The Sage family. The generic name is from a Hebrew word referring to the bitter

White Amaranth (*Amaranthus albus*. L.).

character of the plant. The specific name means common. This is a well-known introduction from the old world, and has spread over the temperate regions of the earth. The popular name refers to the hoary appearance. It is perennial, woolly, with much wrinkled, generally round, toothed, opposite leaves. The flowers are white and clustered in leaf angles. The hooks on the calyx assist in the dispersal of the seeds. The plant is occasionally used as a domestic bitter.

III.—Plants not Proclaimed, but more or less Widely Spread, and in Greater or Less Degree Troublesome.

**Acæna ovina*. A. Cunningham. Sheep Burr. Order, Rosaceæ: The Rose family. The generic name is from the Greek *akaina*, a goad, and refers to the spiny fruitlets. The specific name from *ovis*, a sheep

(Latin), indicates the supposed fondness of sheep for this species. This is an erect, perennial native plant. The paired leaflets are provided with silky hairs, especially beneath. Fruitlets covered with short, irregularly arranged, barbed prickles which attach to sheep, and depreciate the value of the wool. Another species, *A. Sanguisorba*. Vahl. is a great nuisance in parts of the State, especially along the coast.

**Amaranthus albus*. L. White Amaranth. Order, Amarantaceæ. The name of both order and genus is from the Greek *amarantos*, unfading, in reference to the lasting character of some of the flowers included. The second name refers to the somewhat white colour of the branches. This erect, branched, light-green annual is a native of North America. The leaves are alternate, usually oblong, and the midrib projects beyond the blade into a point. The flowers are minute, and destitute of petals. The seed is round and glossy, like a tiny glass bead. It is known as Tumble Weed in America.

**Amaranthus viridis*. L. The Green Amaranth is sometimes claimed as a native. It is widely distributed in warm and temperate regions. Most specimens are erect with purplish stem. The leaves are thin, oval, pale green, lighter below, with prominent veins. The flower clusters are green. This is a common garden and wayside weed. The young shoots can be eaten like spinach.

**Anagallis arvensis*. L. Pimpernel. Order, Primulaceæ: The Primrose family. The generic name is from the Greek *anagelao*, to laugh aloud. The ancients regarded the Pimpernel as an infallible cure for despondency. Its liking for cornfields is indicated in the second name. This is a well-known little European annual, with branched, four-sided procumbent stems, opposite leaves and red flowers. For protection the flowers close with humidity, hence the plant is called the Shepherd's Weather Glass.

"Closed is the pink-eyed Pimpernel

. . . .

'Twill surely rain I see with sorrow."

The Pimpernel possesses poisonous properties. A blue-flowered variety *A. cærulea* may often be seen.

**Bartsia latifolia*. Sibthorpe. Common Bartsia. Red Nettle (Local). Order, Scrophulariaceæ: The Foxglove family. Linnaeus named this genus in honour of his friend Dr. Bartsch. *Latifolia* means broad-leaved. This small annual is from the Mediterranean region, and has reddish stem, leaves, and flowers. It is partly parasitic on the roots of grasses. The plant is widely spread in pastures on both sides of the Murray.

**Bulbine bulbosa*. Haworth. Yellow Grass Lily: Wild onion. Order, Liliaceæ: The Lily family. The derivation is the Greek *bolbos*, a bulb. This handsome yellow-flowered native plant has leaves resembling those of the onion. When broken, a glairy, slimy liquid exudes from the leaves. The filaments are all bearded. Though no poison has been determined, this plant is responsible for considerable mortality among lambs in this district. The symptoms are vertigo, scouring, and discharge of greenish mucous from the nostrils. Five grains of potassium permanganate are usually efficacious in promoting recovery, if the administration is not too long delayed. Breaking up the land is the only way to eradicate this pest.

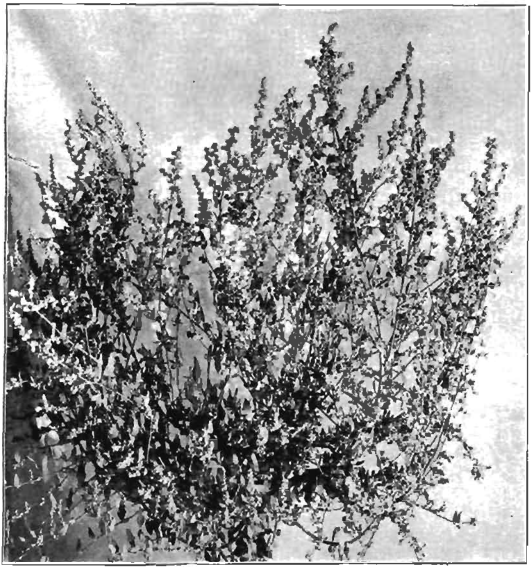
**Capsella, Bursa-pastoris.* Moench. Shepherd's Purse. Order, Cruciferæ: The Cabbage family. The generic name compares the seed vessels to a small capsule (Latin *capsula*, a small box or capsule). The specific and popular names are identical. This is an introduction from Europe, and is a very common annual with erect stem, and rosette of basal leaves. The tap root is long, flowers white, pods flattened and triangular. The plant seeds freely, and several crops are produced in a season. It causes taint of milk when freely eaten by dairy cattle. The Shepherd's Purse is subject to a fungus, *Cystopus candidus*, which may be communicated to the many economic plants of this order, and is suspected of also harbouring the fungus responsible for club-root of Cabbage.

**Cerastium vulgatum.* L. Mouse-ear Chickweed. Order, Caryophyllaceæ: The Pink family. The generic name is from the Greek *Keras*, a horn from the shape of the seed vessels. The specific name signifies common. This is an almost cosmopolitan, and also a very variable plant. It is an annual or biennial, much branched, hairy and usually quite clammy, causing insects to adhere. It resembles the common chickweed, except it is coarser and pubescent. The stem leaves are sessile, but the radical leaves are stalked. The flowers are inconspicuous; the notched white petals are not usually longer than the sepals. The capsule is horn-shaped and projecting, whence name of genus. This is a common weed of gardens, &c., but is easily controlled.

**Chenopodium album.* L. Fat-hen or White Goosefoot. Order, Chenopodiaceæ: The Saltbush family. The name is from the Greek, *Chen*, goose; *pous, podium*, foot; the leaves resembling web-feet. This introduction from the Old World is an erect, rather robust annual. The leaves and whole plant when young are furnished with a mealy, white covering suggesting the specific name. The flowers are green and inconspicuous. The young shoots may be used as a substitute for spinach. This is a common weed of gardens, &c. Cattle will eat it, if compelled, but it is indifferent fodder. **C. carinatum.* R. Brown.—Named from its keeled perianth (Latin, *carina*, a keel); is a common prostrate, hairy, odorous, native plant that has become a troublesome, useless weed, and is spreading. **C. glaucum.* L.—Gets its name from the bloom with which it is covered (Latin, *glaucus*, bluish-grey). This plant is of a more or less prostrate habit, with rather thick leaves. It has no fodder value. **C. murale.* L. (Latin, *murale*, pertaining to a wall), is named from its habitat. This is also called Fat-hen. It is an erect plant with branched, reddish, stems; leaves green on both sides, though sometimes mealy underneath, and called from their shape the "Nettle-leaved Goosefoot."

**Cichorium intybus.* L. Chicory or Succory. Order, Compositæ: The Daisy family. The Arab name *Chicourey* has been adopted with slight alterations. *Intybus* was the original generic name. This is an erect, branched, tall perennial, indigenous to Europe, Asia, and North Africa. The flowers are large, pretty, blue coloured, and usually close at night. It is cultivated to obtain the root to mix with coffee, and is an "escape" which has degenerated and spread. As far back as Virgil's time it was regarded as a weed, for he writes, "Spreading succory chokes the rising field." The blanched leaves are used as salad in France under the fanciful name of "barbe de Capucin." Chicory, Endive, and Dandelion formed the "bitter herbs" of Scripture.

**Cynodon dactylon.* Persoon. Couch grass. Order, Gramminea: The Grass family. This plant is sometimes called Dog's Tooth Grass, which is a literal translation of its generic name—from Greek, *Kuon*, dog; *odous, odontos*, tooth. The specific name is in allusion to the finger-like form of spikes. This is a well-known cosmopolitan grass with creeping, rooting stems, both above and below ground. The leaves are rather short and sometimes glaucous green. The finger-like spikes are often purplish from the colour of the anthers. In pastures in this and similarly dry districts this grass provides useful fodder. It makes a good



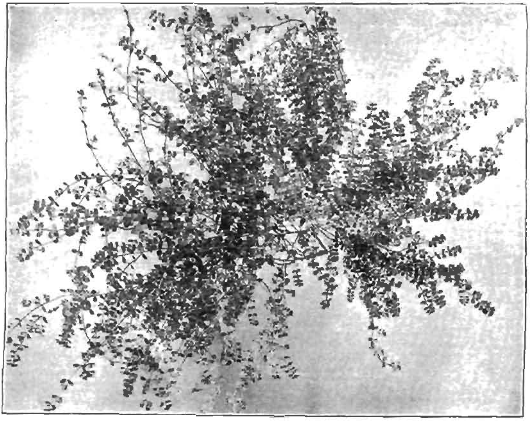
Fat-hen or White Goosefoot (*Chenopodium album*, L.).

lawn grass, but becomes discoloured in winter. In vineyards and gardens it is a troublesome weed, and as every portion of the underground stem will grow the difficulty of eradication is increased. It is considered sacred by the Hindoos, who use it for ceremonial purposes.

**Erodium cicutarium.* l'Heritier. Stork's-bill. Order, Geraniaceæ: The Geranium family. The name of the genus is from the Greek, *erodios*, a heron, from the resemblance of the fruits to that bird's head and beak. The specific name, from the Latin *cicute*, hemlock, refers to the

resemblance of the leaves. This is another annual or biennial from the Mediterranean region. It is a small, pink-flowered plant with finely-divided leaves, and possesses a slight fodder value. It is known in America as Alfilaria, a Spanish-Mexican name, from its *pin-like seed points. The seeds are pointed,* and have a corkscrew action. The Musk Erodium*, *E. moschatum*, l'Heritier, can be recognised by its musky smell, which deters cattle from eating it. The endemic blue-flowered *E. cygnorum*, Nees, has a better reputation as a fodder plant.

**Euphorbia Drummondii*, Boissier. *Flat Spurge. Order,* Euphorbiaceæ: The Castor Oil plant family. The first name is that of the Greek physician Euphorbus, who first used an allied plant in medicine. The specific name is in honor of James Drummond, a West Australian



Flat Spurge (*Euphorbia Drummondii*, Boissier).

botanist. Flat spurge is a prostrate little plant with branched stems, milky sap, small, opposite leaves, and reddish or purplish glands. This is now a very common weed of arable and pasture lands. It has been accused of poisoning stock, but, apparently, without sufficient justification, as stock eat it without injury. Occasionally this plant is used in bush medicine in Queensland, where the allied *E. pilulifera L.* is known as Asthma herb. The order has a reputation for acrid and poisonous properties.

Fœniculum vulgare, Miller. (*F. officinale, Allioni.*) Fennel. Order, Umbelliferæ: The Carrot and Parsley family. The generic name was long ago in use in the Latin, and is thought to be a diminutive of *fœnum* hay from a fancied resemblance in smell. This plant from the Mediterranean region is a garden escape on the Wahgunyah-road, and a few

other localities. It is a tall, yellow-flowered plant with finely-divided leaves. There is no difficulty in recognising it by its strong smell. The young shoots are used boiled as a vegetable, or even when young used as salad. Portions of the plant are also used as ingredients in sauces and condiments. Longfellow's poem refers to the ancient belief that fennel would restore lost vision, and give the gladiators strength.

**Fumaria officinale.* L. Fumitory. Order, Fumariaceæ. The generic name is from *fumus*, smoke, from the smell of the bruised plant. Ancient writers affirm the name is from *fumus terræ*, and allege the plants sprang from the "fumosity of the earth." This is another introduction from the Old World. It is a prostrate, straggling, spreading plant with much divided, pale-green leaves with flat, almost prehensile segments. The rather pretty pink flowers are borne in racemes. In the southern part of the State it has spread rapidly over considerable areas of arable land. The seeds retain their vitality for a long time. At Mudgee, New South Wales, it has been reported to smother a wheat crop. Even in the time of Shakespeare it was a well-known weed, for he has several references to it.

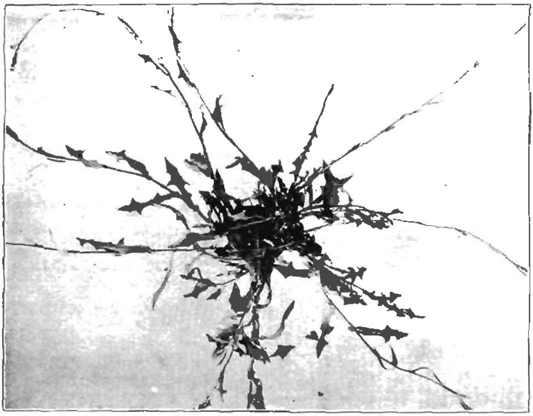
**Heliotropium europæum.* L. European Heliotrope. Order, Boraginaceæ: The Heliotrope family. The generic name is from the Greek *helios*, the sun, and *trope*, a turning towards. As observed by Dioscorides and Pliny, the flowers turn sunwards. The specific name indicates its European origin. It is native of the Mediterranean region. This is an erect, branched, hairy annual. The leaves are oval, often undulate, on rather long stalks, grey-green in color, and show the veins prominently underneath. The flowers are creamy white, borne on one-sided bractless spikes, of which the terminal ones are usually paired. This is a fairly common weed, which is spreading on the river flats at Gooramadda.

**Hypochæris radicata.* L. Flatweed. False Dandelion. Order, Compositæ: The Daisy family. The generic name is from *hypo*, for, and *choires*, a pig (Greek), because these animals are fond of the roots; c.f., French name Porcelle. The specific name refers to its deep roots. Native to the Mediterranean region, this plant has spread almost everywhere. It is a perennial, with hairy leaves forming a rosette on the ground. The flowers are large and the flowerheads are borne on long stalks. *H. glabra* is a smaller weed, and is without the hairy leaves, as its name indicates.

Lactuca scariola. L. Prickly Lettuce. Order, Compositæ: The Daisy family. The name is from *Lac*, milk, from the milky juice of these plants. *Scariola* is the old generic name indicating its prickly character. This is a very tall, erect, annual or biennial, of which the lower stem, leaf-margins, and midrib are furnished with prickles. The leaves are not lobed, and clasp the stem by an arrow-shaped extension at their base. The leaves have a tendency to grow in a north and south direction, and this has earned for the plant, with others, the name Compass plant in America. Native originally of the Mediterranean region, it has spread nearly all over the world. It is regarded as the original whence all our varieties of lettuce have been derived. It is not common, but appeared near Chiltern, where "sparrows in flocks devoured the seed, and so reduced the pest considerably" (Anderson).

**Lactuca saligna.* L. The Willow Lettuce is occasionally seen. It is a more slender, often branched plant, with pinnatifid leaves and without the prickles characteristic of the former species. Sheep seem to appreciate this plant in droughty seasons.

**Lepidium campestre.* R. Brown. Field pepper grass. Cow grass in America. Order, Cruciferæ: The Cabbage family. This native of Europe is a strong-growing annual or perennial of downy appearance. The stem is erect and much branched above. The basal leaves are usually stalked; the stem leaves are arrow-shaped and clasping. The flowers are inconspicuous, white or yellowish in colour. The winged seed vessels are spoon or boat shaped, being hollowed on one side, and are notched at the summit. The seeds are fairly large, oval in shape,



The Willow Lettuce (*Lactuca saligna*, L.).

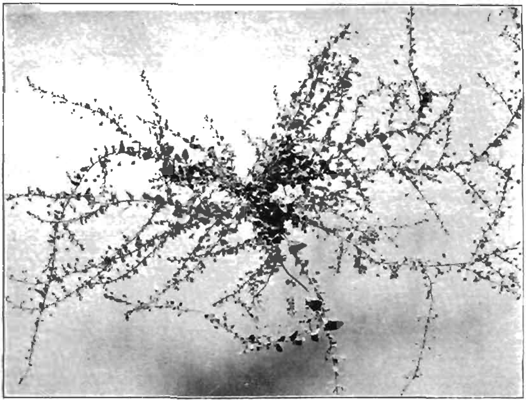
and brown in colour. They become shiny when wetted. The species name indicates the favorite habitat of this species, which is never likely to cause serious trouble like the following.

**Lepidium draba.* L. Hoary Cress. Order, Cruciferæ: The Cabbage family. The generic name was used by Dioscorides from Latin *lepis*, a scale, from the scale-like shape of seed vessels. Fuchs, however, says the name was given because the plant was used to remove scales and spots from the face. *Draba* is an old Greek name for a kind of cress. The hoary cress is a native of Europe, Asia, and North Africa. It is a perennial, downy-white plant, with robust branched stems. The upper leaves clasp the stem by an arrow-headed base; the lower leaves are stalked. The flowers are creamy or dirty white, and the seed vessels heart-shaped. This is a very serious pest, as almost every portion of the

root will grow, and, being a deeply-rooted plant, it is most difficult to eradicate. An old plant was found in the College Farm, having come from Werribee.

**Lepidium ruderale.* L. The Waste Places Cress, as it is popularly called in Queensland, is a native. As its name indicates (*rudera*, rubbish), it is found on waste places, where it is a common weed. It is rather tall, occasionally hairy, basal leaves soon dying. The flowers are minute and destitute of petals, seed vessels oval, notched at top, and borne in racemes. *This is a very variable plant, some specimens being* almost spiny.

**Linaria elatine.* Desfontaines. Hairy Toad Flax. Blanket Weed (Local). Order, Scrophulariaceæ: The Foxglove family. The genus gets its name from its resemblance to flax (*Linum*). This is an annual,

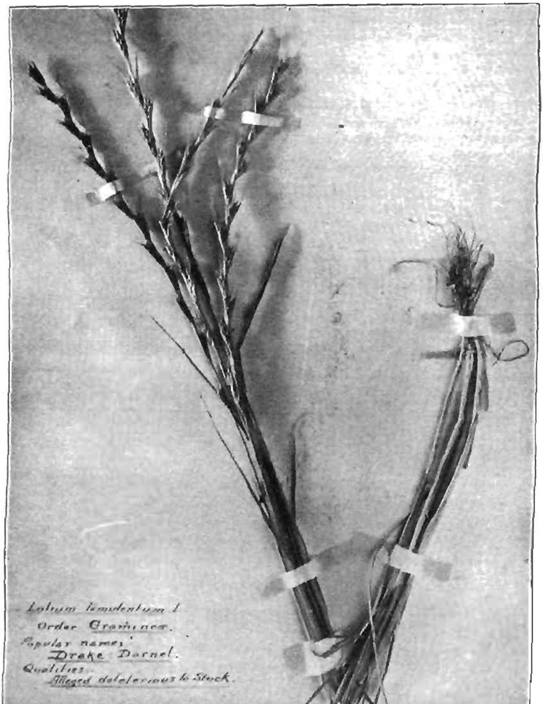


Hairy Toad Flax or Blanket Weed (*Linaria elatine*, **Desfontaines**).

prostrate, hairy or woolly, with yellow flowers. Has not been long naturalized in the district, but is spreading, and is a useless, troublesome weed. The prefix of an animal name is common in English plant names, *e.g.*, horse-chestnut, dog-rose, toad-flax. The prefix toad in the common name refers to the spurious character of the plant compared with the true flax.

**Lithospermum arvense.* L. Iron weed. Corn Gromwell. Order, Boraginaceæ: The Borage or Heliotrope family. The generic name is from the Greek *lithos*, stone, *sperma*, seed, from the hard seeds and their polished appearance. The specific name refers to its presence in cornfields. This is a small, erect, branched annual, grayish in colour and rough in appearance, owing to the presence of minute hairs. The flowers are small, funnel-shaped, with five rounded lobes, and of a

creamy-white colour. The hard seeds retain their vitality for a considerable time. This plant, which is a native of Europe, Asia, and North Africa, is common in wheat-fields. It is called Stonesced and Wheat-thief in America.



Drake. Darnel (*Lolium temulentum*, L.).

**Lolium temulentum*. L. Drake. Darnel. Order, Gramineæ: The Grass family. *Lolium* is the old Lafin name for Darnel, Cockle, and Tares. The specific name means intoxicated, and refers to the alleged properties of the seed. *Gerarde (1597) says, "New bread, wherein*

Darnel is, eaten hot, causeth drunkenness." Rye grass (originally ray grass) is from the French *Ivraie*, darnel, which, in turn, is derived from *Ivre*, drunkenness. The alleged poisonous properties of Darnel are now generally believed to be due to a fungus. The common name Drake is a modification of a very old English word referring to this and other weeds of corn-fields. This is the "tares" of the New Testament.

**Lythrum hyssopifolia*. L. Hyssop-leaved—or Small—Loose-strife. Order, Salicarieæ: The Loose-strife family. The name is from *Lythron*, a Greek term for blood, and is in reference to the color of the flowers of the early-known species. The specific name refers to the resemblance of the foliage to that of hyssop. This is a native, and, in fact, almost a cosmopolitan plant. Its inclusion here is due to the fact that several inquiries have been made regarding it by local farmers. The Small Loose-strife is a prostrate, diffuse plant, with ascending tip, and has a partiality for damp places. It is common along creeks and drains, and has spread somewhat extensively in pastures on flats or low-lying land. The prostrate stems form roots. The leaves are small and narrow, opposite on lower, and alternate or scattered on upper, part of stem. The flowers are solitary, small in size, and pink in colour. They are borne in the axils of the leaves. As this plant seeds very freely, it may spread rapidly if neglected, but can be readily controlled.

**Malva parviflora*. L. Small-flowered Mallow. Order, Malvaceæ: The Mallow family. Malva is the Latin name, probably from Greek *malasso*, to soften, from its emollient properties. This is a well-known annual weed from the Mediterranean region. The stem is often branched, leaves roundish, leaf stalks downy, flowers small and pink. The fruits of the Mallows are called "cheeses" and are eaten by children in England. Mallow shoots are sometimes used as a pot-herb.

**Malva rotundifolia*. L. Dwarf Mallow. The specific name refers to the round leaves. This is also a common farm-yard weed.

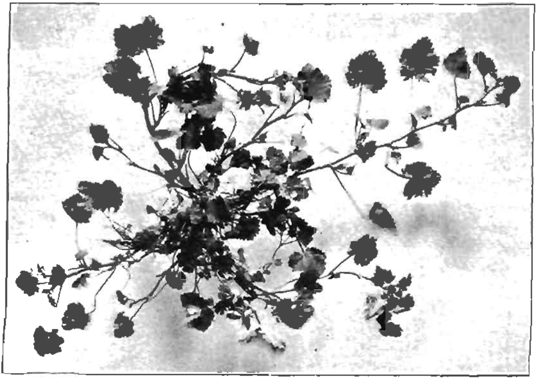
Melissa officinalis. L. Balm. Order, Labiatæ: The Mint and Sage family. The name is from the Greek *melissa*, a bee, from its honey-yielding property, and Latin *officinalis*, pertaining to a shop. This well-known native of Southern Europe and Western Asia should, perhaps, hardly be included as a weed. It is a garden escape in a few places, and is a perennial, odorous, branched, and often downy herb. The leaves are stalked, wrinkled, oval in shape, with toothed edges. The flowers are white. It yields a volatile oil, faintly resembling lemons, French name *citronelle*. When in bloom the plant is much frequented by bees.

**Modiola multifida*. Moench. Red-flowered Creeping Mallow. Order, Malvaceæ. The generic name is the Latin for the nave of a wheel, and records the fancied resemblance of the whorled carpels to a wheel. The specific name is in allusion to the leaf divisions. This American plant is a creeping perennial, slightly hairy. The stems form roots at the joints. The flowers are red. This weed was introduced into Queensland with packing round trees. It is of no value as fodder, but stands drought well, and crowds out useful pasture plants.

Oenothera biennis. L. Evening Primrose. Order, Onagrariaceæ: The Fuchsia family. The genus gets its name from the Greek *Oinos*, wine, *therao*, to pursue eagerly. It was alleged eating the roots was an incentive to wine drinking, but others say it dispelled the effects of wine. This is a garden stray, and is a North American native. It is a tall biennial with somewhat downy, often reddish stems. Leaves lanceolate,

with prominent white midrib, waved margins with small teeth. The large bright yellow, fragrant flowers are mostly fertilized by twilight-flying insects, especially in the early season. Later the plants keep "open house" practically all day. In America it is considered a troublesome pest. Here it is not formidable, and is practically confined to the railway reserve near Lilliput and Rutherglen. It has also been noticed near Wahgunyah.

**Oxalis cernua.* Thunberg. South African Wood Sorrel. Order, Geraniaceæ: The Geranium family. The generic name is from the Greek *oxys*, sharp or sour, from the acid taste of leaves; *cernua* means inclined, nodding. This is a South African plant, and is a garden escape. It is a bulbous plant with basal leaves, consisting of three leaflets. The umbels of pretty yellow flowers droop, hence its specific name. As it reproduces by bulbs as well as seeds, it spreads rapidly. Sparrows have



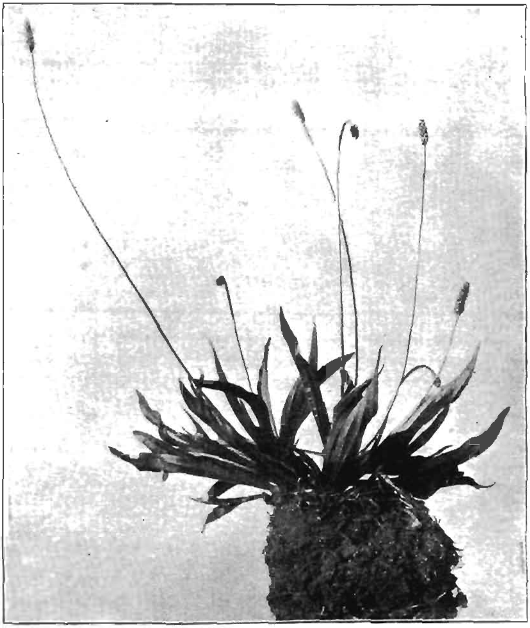
Red-flowered Creeping Mallow (*Modiola multifida*, Moench).

been credited with spreading the bulbils. This is a very troublesome weed, which should be given no quarter.

**Papaver hybridum.* L. Poppy. Order, Papaveraceæ. The generic name is the very old Latin one, and refers to the thick, milky juice which forms opium. This is an introduction from Europe and Asia. It is an annual, erect, hairy; with milky sap, divided leaves, and red flowers, and is easily recognised by its hairy seed vessel. In olden times the poppy was regarded as the symbol of fecundity, hence it was not considered the crops would be good unless plenty of poppies grew among them. Modern agricultural science has dispelled this and other myths. The plant is not at all common here.

**Plantago lanceolata.* L. Rib-grass. Plantain. Order, Plantaginaceæ. The generic name is Pliny's, said to be from the Latin *planta*,

the sole of the foot, perhaps in reference to its way-side growth in well-trodden situations. The specific name refers to the spear-shaped leaves. Rib-grass is a well-known plant that has spread from Europe and Asia almost everywhere. The leaves, which are covered with very fine hairs, spring from the base, and have a prominent midrib with two conspicuous veins on either side. The inconspicuous individual flowers are crowded into a spike on long flower stalks. This plant will grow in dry and



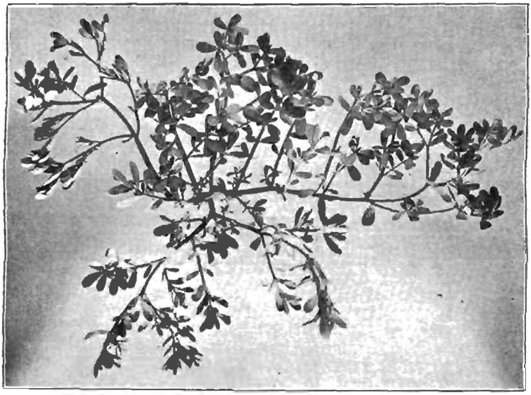
Rib-grass. Plantain (*Plantago lanceolata,* L.).

rather barren spots, and is sometimes recommended in grass mixtures, but its slight fodder value does not compensate for the room it takes. In Ohio it "ranks among the worst weeds."

**Polygonum aviculare.* L. Hog-weed. Wire weed. Order, Polygonaceæ: The Rhubarb and Dock family. The genus is named from the Greek *polys,* many, *gonu,* a knee, or a knot in a reed, and applies to the many-jointed stems. The specific name, from a diminutive of *avis,*

a bird, refers to it as a bird food. This weed has found its way from Europe, Asia, and Africa over the whole world. It is a prostrate annual with wiry, jointed stems, inconspicuous white flowers, and is a common weed of cultivated land, paths, and waste places. Yields a welcome, if not very nutritious, food for stock.

**Portulaca oleracea.* L. Purslane. Pig-weed. Order, Portulaceæ. Some writers give the origin of this ancient name from *porto,* to carry, *lac,* milk. Baron von Mueller says Pliny "derived it from the form of the leaves, door-shaped in miniature." The specific name indicates its edible character as a vegetable. This is almost cosmopolitan, and was used as food by the ancients. Australian explorers attribute good health to eating plenty of this plant. It is an annual, prostrate plant, stems reddish, especially towards base, both stems and leaves fleshy. The



Purslane. Pig-weed (*Portulaca oleracea,* L.).

flowers are small, and the yellow petals soon fall. Natives ate the tiny seeds, and the plant is a good substitute for spinach.

**Rumex acetosella.* L. Sorrel. Order, Polygonaceæ: The Rhubarb and Dock family. The generic name is a very ancient one, and is "in allusion to some faint resemblance of the leaves to the old Roman war arms." The specific name refers to the sourness of the plant. Of European and Asiatic origin, this plant is now distributed in all temperate regions. Sorrel is a slender, erect plant, with creeping underground stems. The leaves are spear-shaped, or more like the ancient halberd. The flowers are tiny, and the male and female parts are on different plants. It is a troublesome weed, whose presence is an indication of sourness in the soil, and absence, or scarcity, of lime. Sorrel is occasionally eaten as a salad or cooked as a vegetable. To this genus belong the well-known Docks.

**Rumex conglomeratus.* Murray. The Clustered Dock is a well-known perennial weed. All the Docks enumerated are from Europe and Asia. **R. crispus,* L.—The Curled Dock has leaves with undulated margins. **R. obtusifolius,* L.—The Broad-leaved Dock has broad, blunt leaves. **R. pulcher,* L., is called the Fiddle Dock, from a fancied resemblance to a violin in the shape of leaves. Docks are common, but only serious in this dry district in moist situations.

Salvia verbenaca. L. Wild Sage. Order, Labiatæ: Mint and Sage family. The generic name is from the Latin *salveo,* to be in good health, from the reputed curative powers of some salvias. The specific name refers to the resemblance to a verbena. This is a native of Europe and Asia, and is an erect, branched, strong perennial, hairy-stemmed, and odorous. The leaves are opposite, and vary in shape from oval to oblong, wrinkled, somewhat lobed with rounded teeth (crenate). The flowers are blue in colour and small in size. This is quite useless, and is likely to become a troublesome weed if allowed to spread, as it appears to be doing in local pastures.

**Scabiosa maritima.* L. Pincushion. Order, Dipsacaceæ: The Teasel family. The genus received its name from its reputed efficacy in cutaneous diseases (Lat. *scabies,* itch, leprosy). This is a tall annual or perennial. The flowers popularly known as pincushions, and are from white to deep red or purple in colour. This is another garden escape. The only specimens seen in the College grounds were just outside the garden a few years ago. It is common in parts of the borough. In some districts it becomes a troublesome weed.

**Sherardia arvensis.* L. Field Madder. Order, Rubiaceæ: The Madder and Coffee family. This small, slender annual is a native of the Mediterranean region. It is grayish-green in colour, with sometimes almost a bluish tinge. The stems are four-sided, rough and procumbent. The leaves are in whorls of usually six, though frequently four on lower stem. The flowers are minute, terminal, funnel-shaped, lilac in colour, surrounded and exceeded by an involucre. The conspicuous calyx teeth persist on the fruits. The generic name is in honour of Wm. Sherard, an English botanist, and its species name indicates its predilection for cultivated land. This is a small, widely-spread weed, unlikely to cause much trouble.

**Spergula arvensis.* L. Corn Spurry. Order, Caryophyllaceæ: The Pink family. The genus gets its name from the Greek *speiro,* to scatter seed (Latin, *spargo*). This is a small, slender annual from the Mediterranean region, sometimes downy. The leaves are linear, unequal in size, and grooved below. They are arranged in two opposite clusters, and thus resemble a whorl. The flowers are white. As its specific name indicates, this is a common weed of cornfields, where, if very abundant, it is a menace to the young, growing crop.

**Spergularia rubra.* Persoon. Sand Spurry. Order, Caryophyllaceæ: The Pink family. This genus is named from its resemblance to *Spergula,* and the specific name indicates the colour of the flowers. This is a common wayside annual or biennial, frequently downy in appearance and clammy to the touch. The narrow linear leaves are provided with conspicuous, dry, thin, membranous stipules, and the flowers are red or pink.

**Silene gallica*. L. French Catch Fly. Order, Caryophyllaceæ: The Pink family. The derivation is from the Greek *sialon*, saliva, from the gummy secretion which earns for this plant its popular name. The specific name indicates its French origin. This is an introduction from Europe, which has spread almost all over the globe. It is a small, erect, hairy, sticky annual, with pink or whitish flowers usually turned one way. Tiny ants seem more often caught by this plant than flies. It is common along fences, headlands, &c., but is not a serious pest.

**Sisymbrium officinale*. L. Hedge Mustard. Order, Cruciferæ: The Cabbage family. *Sisymbrion* was a Greek name given to some fragrant aquatic plant not now recognised. This common way-side annual is native to Europe and West Asia. It is an erect, tall, somewhat downy plant, with stiff branches spreading horizontally. The flowers are inconspicuous, and of a light yellow colour. The seed vessels are short, tapering, downy, sharply-pointed at tip, and closely pressed when ripe to the leafless stem.

**Solanum nigrum*. L. Black Nightshade. Order, Solanaceæ: The Potato family. The generic name is from *solor*, to soothe, from the narcotic properties of genus and order. The specific name refers to the black berries. This is a cosmopolitan plant, claimed often as indigenous. It is an erect, branching, dark-green annual with small white flowers and black berries. Dioscorides attributed poisonous properties to this plant, a character it still retains, even if unjustly. It is a common vineyard weed of late years. The Wonderberry, an alleged hybrid between *S. guineense* and *S. villosum*, cannot be botanically distinguished from this weed.

**Sonchus oleraceus*. L. Sow-thistle. Order, Compositæ. *Sonchos* is the Greek name of this plant, probably from *samphos*, hollow, spongy, from its stems. The specific name refers to its use at one time as a vegetable. This is a well-known cosmopolitan weed. It is an erect annual with hollow stems and milky sap. The upper leaves clasp the stem. There are prickles on the leaf margins. The flowers are yellow. It is not a serious weed, and is readily eaten by stock.

**Stachys arvensis*. L. Hedge Nettle. Field Stachys. Stagger Weed. Order, Labiateæ: Mint and Sage family. The name is from the Greek *stachys*, a spike, from form of inflorescence, while the specific name refers to its partiality for arable land. This is a native of Europe, and is a dwarf, hairy, decumbent annual. The leaves are stalked, oval in shape, and with round-toothed margins. The small, pale purple flowers are borne in the axils of the leaves. Its popular name, "Stagger Weed," is from an unjustifiable statement that it is the cause of staggers in animals.

**Stellaria media*. L. Chickweed. Order, Caryophyllaceæ: The Pink family. The generic name from Latin *stella*, a star, alludes to the form of the flowers. Originally native to Europe, Asia, and North Africa, this plant is now found practically all over the world. It is a weak-stemmed, branching annual with small star-shaped white flowers. This species is easily recognised by the single line of short, white hairs running from node to node along the side of the stem. It is commoner in moister districts than ours. When cooked, it is claimed to be an excellent substitute for spinach.

**Taraxicum officinale*. Weber. Dandelion. Order, Compositæ: The Daisy family. The generic name is probably from the Persian or Arabic

name of this plant, though sometimes considered to be derived from the Greek *tarasso*, to agitate, from its reputed medicinal qualities. This is another introduction from the Old World. It is a perennial, with a stout, penetrating root, used in medicine. The leaves are basal, and form a rosette on the surface, are often saw-toothed, and sometimes hairy. The flower heads are solitary, borne on a hollow flower stalk called a scape, and the flowers are yellow. It is commoner in moister climates. When the Normans went to England with William the Conqueror they fancied the curved leaf points were like lions' teeth (dents de lion), whence our popular name. The original generic name was *leontodon*, from the same fancy.

**Tunica velutina*. Fischer and Meyer. Velvet Carnation. Order, Caryophyllaceæ: The Pink family. The generic name is from the tunic-like calyx. The plant is a variety of *T. prolifera*. This plant is fairly common, but not at all troublesome. It may be recognised by its pink-coloured flowers on rather long stalks, and its resemblance to the carnation family.

**Urtica dioica*. L. Tall Nettle. **U. urens*. L. Dwarf Nettle. Order, Urticaceæ. The name of the order and genus is from the Latin *uro*, to burn, from the stinging properties; *dioica* is from the Greek *dis*, two, *oikos*, a house, because the male and female parts are on separate plants. When the pollen is ripe the male flower bursts, and ejects the pollen into the air for the wind to carry to its destination. The word nettle is the same as needle. These plants follow man everywhere. They are too well known to need description, and, as Culpeper, the old herbalist, says, "They may be found by feeling on the darkest night." The Australian tree nettle, *Laportea*, is a formidable and dangerous plant. It is always puzzling to the young botanist to be told that the nettle family includes such plants as elms, figs, mulberries, hops, and hemp.

**Verbascum blattaria*. L. Moth Mullein. Order, Scrophularineæ: The Fox-glove family. The generic name is a corruption of Pliny's name for the plant Barbascum, from the bearded stamens and leaves. *Blatta* is the cockroach which the plant is said to repel, just as it is said to attract moths. The tall flower stalk of this biennial springs from a rosette of dark-green basal leaves. The flowers are generally yellow, the succeeding seed vessels globular, and of the size of garden peas.

Verbascum thapsus, L., is a tall, woolly-leaved, yellow-flowered biennial. Neither is common, and both are probably garden escapes.

Verbena venosa. Gillies and Hooker. Veined Vervein. Order, Scrophulariaceæ: The Fox-glove family. De Theis says that Verbena is from its Celtic name *ferfain*. The specific name is in allusion to its conspicuous leaf veins. Flowering shoots rise from a creeping stem under the surface. The leaves are opposite, rough, and hairy, with prominent veins. The flowers are purple. Colonies of this weed form a dense mass on the ground if unchecked. It has appeared in two or three widely-separated places in the district.

**Vittadenia australis*. A. Rich. Order, Compositæ: The Daisy family. The genus was named in honor of C. Vittadini, a botanical author. This is a dwarf native annual, or sometimes perennial, with much branched stems covered with hairs. The flowers are blue. It is a common weed of pastures, and is spreading.

**Vinca major*. L. Blue Periwinkle. Order, Apocynaceæ. The genus name is from Latin *Vincio*, to bind, from the twining shoots. This

is a garden escape, hardly yet troublesome. The long, trailing stems root at the nodes. It has also vigorous underground stems, so that if it once got established it would be hard to eradicate.

In addition to the above, there are a few grasses that have become naturalized, and which are either useless or injurious. The Silvery Hair Grass (*Aira caryophyllea*, L.) is a delicately pretty grass, rather common, but of no economic value.

**Avena fatua*, L., is the Wild Oat, which may be distinguished from the cultivated variety by the brown hairs on base of flowering glume and stalk, and the strong, bent awn. This is a well-known weed among cereals. The seeds shed early, and so foul the land for subsequent crops, as they retain their vitality for some time in the soil. In its favor it may be said that the wild oat furnishes fodder of some little value. The perennial wild oat is *A. pratensis*, L. Two varieties of Quaking Grass, **Briza maxima*, L., and **Briza minor*, L., are very common. They are ornamental, but of little fodder value.

There are several Brome grasses. The well-known and useful prairie grass is *Bromus unioloides*. Others of the same genus, however, are of little use. The sterile Brome, **Bromus sterilis*, L., is one of the Spear grasses whose seeds are dangerous, and the plant has no fodder value. **B. madritensis*, L.—The Madrid, or compact Brome, stands drought well, but is not appreciated by stock. **B. mollis*, L.—The Soft Brome, is rather handsome, but valueless as fodder. It is frequently the host of a fungus.

**Hordeum murinum*. L. The Barley grass is of little fodder value, dying early, and obnoxious on account of its sharp seeds. *H. pratense*, Hudson, the meadow Barley grass, is found on river flats. The knotted Barley grass is *H. secalinum*, L. All have troublesome seeds.

Several species of *Stipa*, popularly known as Speargrass, are decidedly injurious, as the sharp, corkscrew seeds actually penetrate the skins and injure the eyes of sheep. *S. setacea*, R. Brown, *S. semibarbata*, R. Brown, *S. pubescens*, R. Brown, are all recorded from this district.

Representatives of the genus *Aristida* are, if anything, still more dangerous when seeding. The three-pronged, pointed awns are a menace to the sight, and even the lives, of sheep.

A TEST OF COMMERCIAL FERTILIZERS FOR GRAPES.

The treatment consisted in the annual applications of nitrogen in the form of sodium nitrate, dried blood, and cotton-seed meal, of phosphorus as superphosphate, of potassium as potassium sulphate, and of lime. Nitrogenous fertilizers had a marked beneficial effect upon the yield and quality of the fruit, leaf, and wood growth, whereas lime had no effect, and phosphorus and potassium so little that the use was not profitable. To restore a failing vineyard, the steps required in the usual order of importance, are to secure a good drainage, control insects, and fungi, improve the tillage and general care, apply such fertilizers as may be found lacking, nitrogen being probably most frequently the element needed.

—U. P. HEDRICK and F. E. GLADWIN, New York Agricultural Experimental Station. *Bull. 381, March, 1914.*

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

CULTIVATION.

The necessity for constant surface cultivation is apparent every summer, but more so in dry seasons. Not only in non-irrigable districts is this a necessity, but also in those districts where the trees can be watered, and more so in the latter case. In irrigated orchards, the tendency of the soil, as a result of artificial waterings, is to set and harden. Consequently, stirring the surface must be resorted to, in order to keep up a good mechanical condition of the soil, and also to prevent loss of irrigation water by evaporation.

In non-irrigated orchards, the cultivation work is necessary to conserve what water has entered the subsoil as a result of the winter and spring rains. Soil crusts should not be allowed to form. Summer showers are not alone the cause of these formations; dry weather conditions cause the soil to consolidate, and any trampling or vehicular traffic tend to harden the surface, and thus to allow the escape of moisture that the trees most need.

PESTS AND SPRAYING.

If woolly aphis is at all existent, a spraying with a strong nicotine solution, or with the lime sulphur spray, will keep it in check for the summer.

Codlin moth spraying will still have to be carried on. All affected apples should be gathered and destroyed. None should be allowed to remain on the trees or on the ground. As soon as the workings or marks of the insect are observed, the fruit should be gathered and destroyed. If the fruits are left there is always the danger of the larvæ escaping to a crevice or hiding-place, and so continuing the loss.

Cherry and pear trees may be sprayed with arsenate of lead wherever the slug is present; vines may be sprayed similarly wherever the vine moth caterpillars are found.

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked over towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and the weather will not have a too drying effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be freely flowing, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres; and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It is cut from the scion with a shallow cut, and if any wood in the cutting be left in, this should be taken out of the bud. A smooth clean spot should be selected on the bark of the stock, and a T-shaped

cut made; the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised and the bud inserted between the bark and the wood of the stock. The bud should be gently pushed down into position, and it should then be bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level with a horizontal cut. With practice it will soon become possible to cut buds that will need neither cutting nor trimming. After two or three weeks the buds may be examined to see if they have taken, *i.e.*, if the bud has united thoroughly to the stock. When that occurs the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequently loss of the bud, and also to throw the bud out at a fair angle. Ultimately, this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till this next spring. In this case, the branch above is not cut off, but is left on until the usual winter pruning.

SUMMER PRUNING.

The almost entire absence of a fruit crop has resulted in a vigorous growth in the fruit trees, both of foliage and lateral growth. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the trees. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal growths of the leader, of which there are sometimes three or four, all strong growing, may be reduced to one; retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The result of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that the weak growths and buds may be strengthened, and induced into fruit bearing.

Vegetable Garden.

The vegetable section should be kept in good condition by alternate cultivation and watering. A good surface scarifying with the Planet Jr., or with a hoe, should be given when the soil has well settled after each watering. This will keep the soil in good condition, and the crops in good growth. Where crops are growing, an occasional overhead watering will be beneficial; it will clean and invigorate the leaves.

As soon as a crop has been removed from a plot, the ground should be well manured and dug over. If any pest, such as aphis or caterpillars, has been prevalent, it would be advisable to burn all crop refuse, to destroy any insects that may remain.

Seedlings of such crops as cabbage, celery, lettuce, cauliflower, &c., may be transplanted; and seeds of peas, French beans, turnip, cauliflower, &c., may be planted.

Keep the tomatoes well watered and fed, pinching out surplus and strong-growing laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted.

Flower Garden.

The lawns, flower beds, and shrubberies will need frequent waterings. Such plants as cannas, delphiniums, perennial phloxes, and pentstemons will require a good water supply. These and similar plants will benefit by a good mulching.

Much hand work will be of great benefit in the flower garden and borders at this season of the year. Regular hoeings do much to improve the texture of the soil and to conserve the soil moisture. In shallow and undrained soils constant waterings will be necessary, if the plants are to be kept alive; at the same time there is always the danger of excessive watering in undrained soils.

Mulching will be an important work this month. This work will greatly assist the retention of soil moisture; at the same time, it will greatly reduce the temperature of the soil. Any material that will ultimately be incorporated with the soil in the form of humus is useful for mulching purposes. Dahlias and chrysanthemums should be kept growing and in good heart by watering, light feeding, and mulching. They should also be tied to the stakes as the growths extend.

Pests, such as caterpillars of several species, and red spider, will now shortly appear. For the former, weak sprayings with arsenate of lead or paris green, may be given. Wherever the red spider is observed, the attacked parts should be cut off and burned. Not only should this be done to the chrysanthemums and dahlias, but also to all plants in the beds similarly affected. Constant waterings will often relieve the plants of this trouble, but the most efficacious method is to burn all parts affected as the insect makes its appearance.

Carnations may now be layered, and seeds of pansies and perennial and biennial plants may be sown. A few late gladioli and a few spring flowering bulbs for early flowering, may also be planted.

SOLUBILITY OF PHOSPHORIC ACID IN ROCK PHOSPHATE.

Recent researches have been made in America on the effect of ensilage fermentation and animal digestion upon the solubility of phosphoric acid in rock phosphate.

The experiment consisted of adding rock phosphate to the green fodder being placed in the silo.

The results were unsatisfactory in that not only did the animals soon refuse to eat the silage, but the solubility of the phosphoric acid in the animal excreta was not increased.—Extract from *Journal Industrial and Engineering Chemistry*, June, 1914.

Victorian soils are deficient in phosphoric acid. On the assumption that if you feed the animal you feed the soil, a successful scheme whereby phosphoric acid in the cheap form of rock phosphate is passed through the animal and returned in the excreta to the soil would, indubitably, tend to increase the phosphate content of our soils.

In the above experiments the phosphate content of the excreta from the animals fed on the phosphated ensilage showed a decided increase over those fed on untreated ensilage, although the solubility was not enhanced.

VICTORIAN WHEAT HARVEST—SEASON 1914-15.

PRE-HARVEST ESTIMATE.

Based on Information Furnished by Farmers.

Counties.	Estimated Area Sown for Grain.	Estimated Yield of Wheat.	
		Per acre.	Total.
	acres	bushels.	bushels.
Grant	13,200	4·10	54,120
Talbot	22,800	2·50	57,000
Grenville	29,700	10·00	297,000
Hampden	19,200	9·75	187,200
Ripon	73,200	4·50	329,400
Lowan	170,200	2·15	365,930
Borung	380,900	1·10	418,990
Kara Kara	153,100	1·25	191,375
Weeah	162,400	0·30	48,720
Karkarooc	478,000	0·35	167,300
Tatchera	309,500	0·45	139,275
Gunbower	64,400	0·25	16,100
Gladstone	141,900	1·80	255,420
Bendigo . ..	193,700	0·80	154,960
Rodney	147,100	1·25	183,875
Moira	331,700	1·90	630,230
Delatite	16,600	4·90	81,340
Bogong	47,100	4·80	226,080
Other Counties	36,200	7·75	280,550
Total estimated area and yield 1914–15 ...	2,790,900	1·46	4,084,865
Total area and yield 1913–14	2,565,861	12·84	32,936,245

A. M. LAUGHTON,
Government Statist.

Office of the Government Statist,
Melbourne, 1st December, 1914.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Monthly Report Ending 14th December, 1914.

The weather during the past month has been somewhat changeable, but on the whole good for egg production.

There has been some heavy rains and some cold snaps, which affected the birds adversely.

The birds are in good health and doing well, although broodies are very troublesome, and some few birds are moulting.

The rainfall for the month was 291 points.

A. Hart, Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Nov.	15th Nov. to 14th Dec.	Total to date, 8 months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns ..	J. H. Gill	1,015	148	1,163	1
36	" ..	E. A. Lawson	1,012	140	1,152	2
26	" ..	Mrs. H. Stevenson ..	909	155	1,064	3
9	" ..	J. J. West	924	130	1,054	4
16	" ..	A. R. Simon	907	147	1,054	5
10	" ..	R. Hay	902	143	1,045	6
17	" ..	F. Doldissen	868	139	1,007	7
33	" ..	W. G. Osburne	858	148	1,006	8
37	" ..	S. Brown	857	127	984	9
4	" ..	Giddy and Son	835	150	985	10
19	" ..	Marville Poultry Farm ..	848	134	982	11
40	" ..	J. Schwabb	862	117	979	12
11	" ..	C. J. Jackson	826	140	975	13
45	" ..	H. C. Brock	845	127	972	14
29	" ..	V. Little	845	126	971	15
44	" ..	A. Ross	840	124	964	16
35	" ..	W. Tatterson	841	119	960	17
23	" ..	S. Buscumb	803	136	939	18
8	" ..	F. W. Brine	767	153	920	19
15	" ..	K. Waldon	802	117	919	20
1	" ..	F. G. O'Bree	775	138	913	21
47	" ..	W. G. Swift	775	131	906	22
28	" ..	Utility Poultry Farm ..	775	122	897	23
30	" ..	G. W. Robbins	760	133	893	24
24	" ..	C. Pyke	747	146	893	25
12	" ..	A. H. Mould	790	89	879	26
34	" ..	W. A. Rennie	751	128	879	27
2	" ..	J. C. Armstrong ..	748	125	873	28
22	" ..	B. Mitchell	748	123	871	29
3	" ..	T. A. Pettigrove ..	780	87	867	30
6	" ..	C. R. Jones	719	141	860	31
38	" ..	G. Hayman	715	139	854	32
20	" ..	A. W. Hall	710	142	852	33
48	" ..	Bennett and Chapman ..	717	131	848	34
14	" ..	F. C. Western	725	109	834	35
13	" ..	H. Hanbury	725	108	833	36
42	" ..	E. W. Hippe	700	128	828	37
32	" ..	Gleadell Bros.	686	133	819	38
18	" ..	All-lay Poultry Yards ..	687	123	810	39
31	" ..	E. H. Bridge	659	138	797	40
41	" ..	Doncaster Poultry Farm ..	652	140	792	41
5	" ..	A. Mowatt	647	141	788	42
21	" ..	R. A. Lewis	636	110	746	43
43	" ..	G. Mayberry	607	134	741	44
39	" ..	R. L. Appleford ..	590	139	729	45
49	" ..	A. Beer	603	116	719	46
50	" ..	F. G. Silbereisen ..	547	123	670	47
27	" ..	Walter M. Bayles ..	537	119	656	48
46	" ..	C. L. Sharman	516	113	629	49
7	" ..	B. Cohen	488	138	626	50
		Total	37,881	6,516	44,397	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Nov.	15th Nov. to 14th Dec.	Total to date, 8 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		DRY MASH.				
60	*White Leghorns* ..	W. N. O'Mullane ..	1,005	155	1,160	1
55	,, ..	E. A. Lawson	972	144	1,116	2
65	,, ..	W. G. Osburne	898	110	1,008	3
53	,, ..	C. Lawson	862	120	982	4
51	,, ..	*Moritz Bros.* .. .	819	127	946	5
58	,, ..	Miss L. Stewart	822	123	945	6
61	,, ..	H. Hanbury	800	120	920	7
63	,, ..	Hanslow Bros.	740	122	862	8
68	,, ..	E. W. Hippe	701	131	832	9
59	,, ..	F. G. Silbereisen ..	665	154	819	10
52	,, ..	Myola Poultry Farm ..	691	126	817	11
62	,, ..	A. Greenhalgh	682	134	816	12
70	,, ..	W. H. Robbins .	685	120	805	13
54	,, ..	G. Carter	683	118	801	14
64	,, ..	E. A. Carne	674	125	799	15
57	,, .	J. Jackson	642	135	777	16
69	,, ..	C. J. Beatty	659	116	775	17
67	,, ..	Walter M. Bayles ..	629	108	737	18
66	,, ..	S. Brown .. .	445	88	533	19
		Total	11,074	2,376	16,450	
		HEAVY BREEDS.				
		WET MASH.				
77	*Black Orpingtons* ..	J. McAllan	938	117	1,055	1
89	,, ..	Marville Poultry Farm ..	867	121	988	2
71	,, ..	J. Ogden	872	104	976	3
88	,, ..	H. H. Pump	852	119	971	4
84	*Rhode Island Reds*	*J. Mulgrove*	801	109	910	5
81	Black Orpingtons ..	D. Fisher	807	92	899	6
82	,, ..	J. H. Wright	801	90	891	7
76	,, ..	W. P. Eckermann ..	749	102	851	8
87	,, ..	A. Douglas	705	131	836	9
75	,, ..	Fairdeal Poultry Farm ..	720	110	830	10
74	,, ..	S. Brown	723	87	810	11
72	,, ..	T. W. Coto	689	117	806	12
73	,, ..	J. A. McKinnon ..	681	107	788	13
83	,, ..	Cowan Bros.	633	99	732	14
85	Golden Wyandottes	J. C. Mickelburgh ..	555	51	606	15
78	Red Sussex ..	Jorgen Anderson ..	524	68	592	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	446	94	540	17
86	Buff Wyandottes ..	W. G. Swift	366	39	405	18
		Total	12,729	1,757	14,486	
		DRY MASH.				
100	Black Orpingtons .	D. Fisher	791	87	878	1
90	,, ..	J. H. Wright	725	94	819	2
98	,, ..	A. Greenhalgh	711	89	800	3
97	,, ..	Jas. McAllan	699	99	798	4
94	,, ..	T. W. Coto	689	76	765	5
91	,, ..	C. E. Graham	638	81	719	6
96	Rhode Island Reds	*Myola Poultry Farm* ..	601	92	693	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	584	90	674	8
93	,, ..	Myola Poultry Farm ..	552	101	653	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	456	74	530	10
95	,, ..	C. L. Hewitt	283	74	357	11
		Total	6,729	957	7,686	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 2. 10th February, 1915.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Bee Expert.

(Continued from page 733, Vol. XII.)

XXVI.—THE HONEY FLORA—(*continued*).

The Fuzzy Box (*Eucalyptus Baueriana*).

The Fuzzy Box, also known as Round-leaf Box, is closely allied to the Red Box (*E. polyanthemos*), of which it was formerly held to be a variety. It is found only in the eastern part of Victoria, particularly in the Lake Tyers and Tambo districts. In general appearance and habit of flowering it differs but little from Red Box.

As a honey producer it is, however, quite distinct from the latter, the honey being clearer, slightly less dense, and without the somewhat objectionable oily flavour of Red Box honey. Nothing definite is, so far, known as to whether bees gather pollen from the blossom.

The Manna Gum (*Eucalyptus viminalis*).

Fig. 11.

This Eucalypt, which is also known as White Gum and Ribbony Gum, is widely distributed over Victoria, but except on alluvial flats it does not appear to occur anywhere in large numbers together, but rather scattered, or interspersed, between other trees, such as Red Gum, Stringy Bark, Messmate, Blue Gum, and Swamp Gum (*E. paludosa*).

In open country it is not a tall tree, but when found in close forest of other Eucalypts it often attains great height and stem diameter. There is great variation in the appearance of the trunk of this tree in different localities, and sometimes even between individual trees growing side by side; a rough, hard bark generally covers the base of the stem, while the upper portion is usually smooth, and white in colour. During

the change of seasons the smooth portion of the bark becomes detached from the trunk in long strips, hence the name Ribbony Gum. In some specimens, however, the rough scaly bark persists to, or even partly, on the branches, while in others almost the whole of the trunk and branches are smooth and clean.

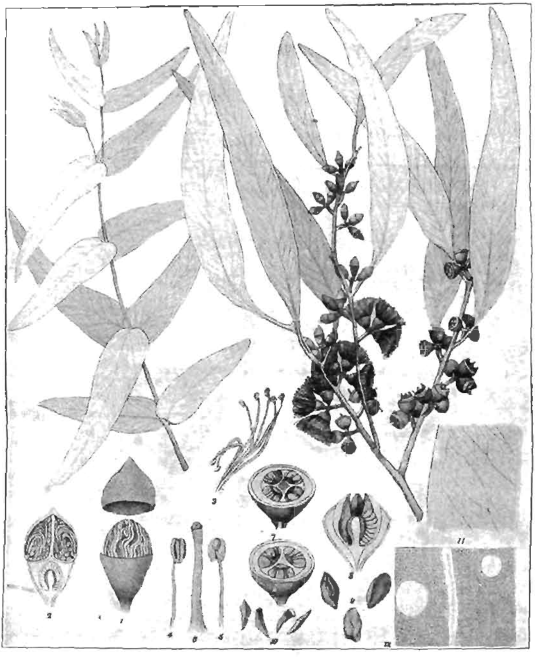


Fig. 11.—The Manna Gum (*Eucalyptus viminalis*, Labillardiere).

The leaves are long, lance-shaped, slightly curved, of the same colour on both sides, the veins rather faint, spreading feather-like, the marginal vein somewhat removed from the edge of the leaf. The umbels are generally, but not necessarily, three flowered, with the buds, flowers, or fruits in line. The buds are oval, more or less pointed, the fruits half-egg shape, with three, four, or, rarely, five cells.

The wood, which is from pale to brown in colour, makes good firewood, and is fairly durable when cut and seasoned, but the standing trees are apt to rot at the centre. When found at high elevations it yields a useful building timber.

This tree is well known on account of the manna it produces, usually during midsummer; it is, however, at times difficult to distinguish it from several others, such as Swamp Gum (*E. paludosa*) and Apple-Gum (*E. Stuartiana*), both of which it somewhat resembles. Reference to the illustrations, Figures 12 and 13, will, however, show that the sucker leaves of each are quite distinct, for while those of *E. viminalis* are narrow lance-shaped, with a roundish base, the sucker leaves of *E. Stuartiana* are roundish, and of *E. paludosa* egg-shaped.

The Manna Gum is somewhat irregular in its habits of flowering and the length of time it is in bud. Two generations of the latter may often be seen on the same branches of a tree, one which will blossom within a few months, and the other which may not do so for eighteen. The flowering most frequently occurs after that of Red Gum, but may occur almost any month of the year. As this tree does not grow in very large numbers in any one locality, it does not produce large and distinct yields of honey, but, owing to its flowering occasionally when other bee forage is scarce, and producing pollen as well as nectar, it is a very useful tree to the beekeeper.

The honey has a distinct sweetness of its own; is clear amber in colour, not very dense, and candies rather readily.

The Swamp Gum (*Eucalyptus paludosa*).

Fig. 12.

The Swamp Gum, Cider Eucalypt, White Gum, grows usually on alluvial flats, particularly in swampy places. It is generally not a tall tree, often of crooked growth, and sometimes dwarfed. In general appearance of the trunk and in the bark it resembles the Manna Gum to a certain degree. The bark is often rough, dark or greyish brown at the butt, and sometimes so up to the main limbs; in other cases, smooth on the stem and the branches, and greyish white in colour. The branches are very spreading. The wood is fairly hard, but as it is rarely straight not much used except for fuel. It makes excellent charcoal. The leaves are lance-shaped, rather pointed at the base, and of equal deep green on both sides, the veins rather distant, moderately spreading, and the marginal vein distinctly removed from the edge of the leaf. The sucker and seedling leaves are oval. The umbels occur singly at the shoulders of leaves, or laterally from the branchlets, and carry from three to ten flowers; the buds are egg-shaped, short pointed, the fruit top-shaped, three, four, or, rarely, five celled.

This tree flowers usually, not very profusely, in autumn; nothing definite is known yet as to the length of time it is in bud. Pollen is gathered from the blossom by bees. The honey is clear amber in colour, not dense, candies, and closely resembles that of Manna Gum. The Swamp Gum is distinguished from the Manna Gum by the broader and shorter leaves, their darker green, and more distant veins, the different grouping of the flowers, and the oval sucker and seedling leaves, as contrasted with the narrow lance-shaped ones of the Manna Gum.

A 2

The Apple Gum (*Eucalyptus Stuartiana*).

Fig. 13.

A medium sized tree, with widely spreading main branches, rarely attaining to 100 feet in height. It grows on rather sandy, and often in moist, tracts of country, on low ridges, and in grass tree country. It occurs in large numbers in the scrub country of the Grampians in company with Messmate, Stringy Bark, and Manna Gum, is of a spreading

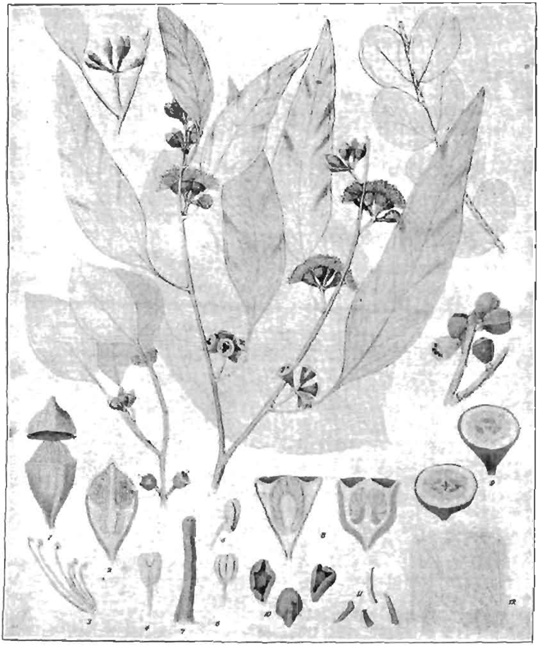


Fig. 12.—The Swamp Gum (*Eucalyptus paludosa*).

habit, with the branchlets slender and drooping. The wrinkled brownish bark is rather scaly on the outside, but fibrous inside, somewhat resembling Stringy Bark, and continues, not only on the stem, but also on the main limbs. The trunk is generally twisted and gnarled rather than straight.

The leaves are scattered, lance-shaped, slightly bent, dark green on both sides; the veins are very thin and spreading, the marginal one removed from the edge; the umbels have usually more than three flowers; the buds are rounded, slightly pointed. The fruits are half-egg or top shaped, very small, oftener three than four celled.

As a somewhat smooth barked variety of this species also occurs it is sometimes mistaken for *E. viminalis*, the Manna Gum. The differences

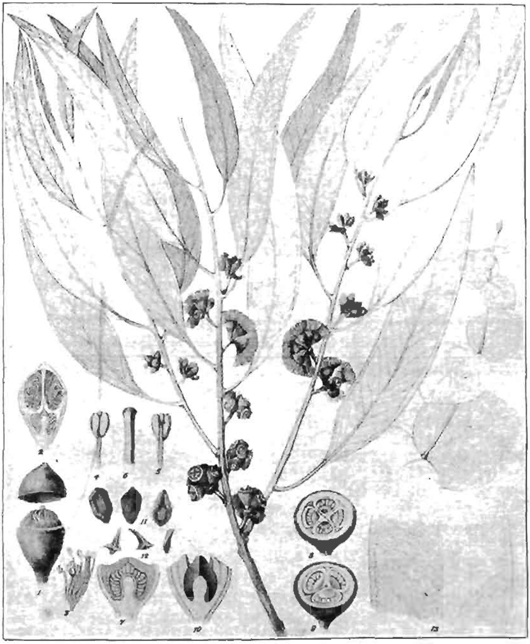


Fig. 13.—The Apple Gum (*Eucalyptus Stuartiana.* F. v. M.).

which separate the two are given by F. v. Mueller in Eucalypts of Australia as follows: The Apple Gum (*E. Stuartiana*) is a more shady tree on account of its spreading habit, more numerous branches, and denser foliage. The leaves yield no manna, and have a more pleasant scent, reminding slightly of the odour of apples. The flowers are usually more than three in a cluster, which is the prevailing number in the case

of the Manna Gum. Further, the seedling and sucker leaves of the two trees are quite distinct, as will be seen on reference to the illustrations, Figures 11 and 13.

This tree has various local names, such as Apple Tree, Apple Gum, and, in the Grampians, Black Butt, on account of the blackening of the bark by periodical bush fires. It blossoms profusely from February to April, and is in bud for twelve to fifteen months. It is a very useful tree to the apiarist, as it flowers more or less every year and produces pollen as well as nectar. The honey is amber in colour, not very dense, and granulates more or less, but is very suitable winter food for bees.

THE LONG-LEAVED BOX (*E. elaeophora*) (*syn. E. Cambgei*).

This tree is found intermixed with other Eucalypts generally on poor soil and rocky hills, but also in more favorable situations in and around the Grampians, the Wimmera, Pyrenees, Upper Avoca, and the drier central part of the Dividing Range north of Melbourne, and in moister localities further east. It is known by many different names in different localities, such as Bastard Box, Apple Tree, Cabbage Gum, Grey Box, and even as Peppermint, to which latter (*E. amygdalina*) it bears no resemblance whatever. It is a stunted tree, rarely straight, seldom up to 3 feet in diameter. The bark, which is thick, but not fibrous, covers the trunk and larger branches; it is from light grey to brown in colour, fairly even sometimes, but rough, harsh, and furrowed in some localities. The wood is coarse, from light to dark-brownish grey in colour, the sap wood often very thick. As a timber it is almost useless, decays rapidly, and is even of little value as fuel.

The leaves are long, lance, and slightly sickle-shaped, of equal colour on both sides, the veins thin, moderately spreading, the marginal vein somewhat removed from the edge; the flower stalks are broadly compressed, the buds markedly angular, with a conical pointed lid, are in single umbels of from four to seven flowers; the fruits are half-egg shaped, lined by two to four angles, and three or four celled.

The Long-leaved Box is easily distinguished from other Eucalypts, in the company of which it is found by its angular buds and fruits. Till recently this tree was considered to be a dwarf variety of the Mountain or Grey Gum (*E. goniocalyx*) (Fig. 14), which is very similar in leaf, flower, and fruit, but very distinct in general appearance. Since classification of the Long-leaved Box as a distinct species, the botanical name, *E. goniocalyx*, should now be dropped by bee-keepers in favour of *E. elaeophora*.

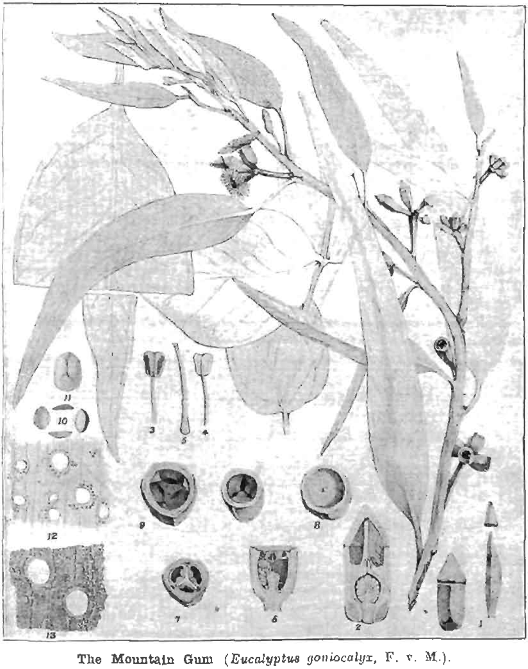
From a bee-keeper's point of view this is in several respects a remarkable tree. It flowers at irregular intervals of four, five, or more years, but then often two years in succession. It is probably longer in bud (eighteen to twenty-one months) than any other Eucalypt; it is a prolific yielder of pollen for bees. It blossoms from March, often right through the winter. The honey is dark, but of fair flavour, and bees invariably winter well on it; it candies coarsely, but not hard.

GREY GUM OR MOUNTAIN GUM (*Eucalyptus goniocalyx*).

Fig. 14.

As mentioned above, the botanical name, *E. goniocalyx*, is now applied to the Mountain Gum only, which also passes under the vernacular names of Mountain Ash, Grey Gum, White Gum, Spotted Gum, and

Bastard Blue Gum. As already indicated, it is almost identical with the Long-leaved Box in leaf, flower, and fruit, but, as distinguished from the latter, it is a tall, straight tree, occasionally exceeding 200 feet in height and attaining a stem diameter up to 6 feet; the wood is hard and tough, varies in colour from a pale yellowish to a brownish colour; it is very durable, and lasts well underground; it is used by wheel-



The Mountain Gum (*Eucalyptus goniocalyx*, F. v. M.).

wrights and in boat building, for railway sleepers, planks, piles, and general building purposes.

Of its nectar and pollen yielding properties nothing is yet known, but it is here enumerated to distinguish and separate it from *Eucalyptus elaeophora*, the Long-leaved Box.

(*To be continued.*)

ANNUAL GRANT TO AGRICULTURAL SOCIETIES.

SUBSIDY CONDITIONS FOR 1915.

CONDITION A.—COMPULSORY.

The awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.

Stallion Inspection Parades will be held at different centres throughout the State prior to the commencement of the Show season (Time Table of Stallion Parades for 1915 will be available shortly after 1st April, 1915). The parade centres are so arranged that all owners of Show stallions have the opportunity of submitting them for examination for the Government Certificate of Soundness before the closing of entries for the Show. Show Secretaries will require to obtain evidence of the possession of the Government Certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the Show, Secretaries of Societies are required to forward the names *of all the horses* that have won the prizes in stallion classes, together with the names of the owners, to the Director of Agriculture.

Failure to comply with the above requirements will result in forfeiture of the grant in aid.

CONDITION B.—OPTIONAL.

AGRICULTURAL CLASSES.

A sum of £10 as a special subsidy will be added to the *pro ratá* grant to such Societies as carry out agricultural classes in strict conformity with the following conditions and to the satisfaction of the Department:—

Applications must be submitted not later than 1st March, 1915.

Thirty students at least must be enrolled before a class can be held.

The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on.

A roll of attendances at lectures and demonstrations shall be kept.

The agricultural classes will extend over two weeks, a demonstration being given each morning and afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society.

At the conclusion of each class, a written examination of about 1½ hours' duration will be held, provided at least five students remain for examination, and the student securing the highest number of marks for examination work and regular attendance combined will be eligible to compete at a final examination of successful students from the various

centres at which the classes have been held. The successful competitor at the final examination will be awarded the gold medal offered by the Australian Natives' Association, provided there are at least five competitors. The Department will grant free railway tickets to students attending the final examination.

Students in attendance at Agricultural High Schools and Colleges, or at the Continuation Schools, and teachers from such institutions or State Schools shall not be allowed to sit for such examination.

Subjects of First Week.

Agriculture.

Live Stock and Veterinary Science.

Subjects of Second Week.

Two or more of the following, to be selected:—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export); (*b*) Dairy Farming (including Management and Breeding of Pigs); (*c*) Poultry Breeding and Management; (*d*) Horticulture, Orchard and Garden Work, Viticulture.

Lectures.

A special subsidy of £1 5s. per lecture will be added to the *pro ratâ* grant to such Societies as arrange for and carry out lectures throughout the year in strict conformity with the following conditions and to the satisfaction of the Department:—

No Society will be allowed subsidy on more than four lectures.

Applications must be submitted not later than 1st March, 1915, and accompanying the application must be a list of the subjects (see page 74) which the Society chooses. The dates of lectures will then be fixed by the Department, and if Societies will state the most suitable seasons for their districts the lectures will, as far as possible, be arranged accordingly.

An attendance of at least fifteen *bonâ fide* farmers, farmers' sons or farm hands will be required, otherwise the lecture will not count for the special subsidy. In case of failure to secure such attendance another lecture will not be substituted, nor will any subsequent lectures that may have been arranged be given.

The President or Secretary or a member of the Council or Committee of the Society must take the chair at each lecture, and must certify as to the number and *bona fides* of the attendance as above required.

The rent of the hall, advertising, and all other local charges are to be paid by the Agricultural Society; all other expenses by the Department.

The Department will recognise any suitable lecture, paper, or address that a Society may arrange to have delivered by any person other than a Departmental officer, and the special subsidy of £1 5s. will be allowed for each such lecture, provided due notification prior to

delivery of lecture is given, and the President of the Society afterwards certifies as to *bona fides* and suitability of the lecture and the number and character of the attendance.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Special crops and catch crops.
7. Irrigation principles and methods.
8. Factors in successful wheat cultivation.
9. Results of experimental work.

Veterinary Science and Live Stock Subjects.

1. The structure and care of the horse's foot (lantern).
2. Brood mares and breeding mishaps (lantern).
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Contagious diseases of stock—abortion, blackleg, tuberculosis, anthrax, pleuro pneumonia, &c. (lantern).
6. Ailments of swine, or ailments of sheep.
7. Unsoundness in horses (lantern).
8. Principles of stock breeding—stud horses (lantern).
9. Teeth of the horse—age, defects (lantern).
10. Injuries to farm animals—first aid.
11. Principles of shoeing (lantern).

Dairy Farming.

1. Breeding and management.
2. Dairy buildings—silos and silage.
3. Dairy management.
4. Milk and cream testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.
7. Cheese making.

Apiculture.

1. The honey industry—handling bees.
2. Breeding and management.
3. Diseases of bees—methods of control.

Poultry Breeding and Management.

1. Incubation—natural and artificial—the rearing of chickens.
2. *Breeds:* payable or otherwise, table and export, eggs—how to select stock.
3. Turkeys: their care and management. Duck raising and care.
4. Foods and feeding, with practical demonstration—mixing the mash.
5. Common ailments of poultry.

Orchard and Garden Work.

1. Fruit growing—Varieties suitable to the different localities, soils and sites.
2. Preparation of land—Planting and pruning.
3. Cultivation—Manuring and management.
4. Insect pests and fungus diseases and their treatment.

The Fruit Industry.

1. Handling, packing, grading, and marketing of fruit for export and local trade.

Viticulture.

1. Establishment of vineyard.
2. Phylloxera and resistant stocks—Preparation of land.
3. Propagation and grafting—Best varieties to grow.
4. Pruning and seasonable operations.
5. Wine-making and cellar management.
6. Drying raisins, sultanas, and currants—Fresh grapes for export.
7. Vine diseases and treatment.

Subjects and Staff.

Principles of Agriculture—Mr. A. E. V. Richardson, M.A., B.Sc.; Mr. Temple Smith.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Messrs. W. A. N. Robertson, B.V.Sc.; E. A. Kendall, B.V.Sc.; R. Griffin, M.R.C.V.S.; R. N. Johnston, B.V.Sc.; R. J. de C. Talbot, L.V.S.

Dairy Farming—Mr. R. T. Archer and staff of Dairy Supervisors.

The Dairying Industry and Export Trade—Messrs. R. Crowe and P. J. Carroll.

Orchard and Garden Work—Messrs. P. J. Carmody, H. W. Davey, and E. E. Pescott.

Sheep Breeding and Management—

Viticulture—Mr. F. de Castella.

Flax Culture and Demonstrations at Shows—Mr. J. E. Robilliard.

Poultry Breeding and Management—Mr. A. V. Rintoul.

Poultry Dressing Demonstrations—Mr. A. Hart.

Potato Culture—Mr. J. T. Ramsay.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. R. T. Archer.

Fruit Industries—Mr. E. Meeking.

Insect Pests—Mr. C. French, Junr.

Plant Diseases—Mr. W. Laidlaw, B.Sc., and Mr. C. C. Brittlebank.

Irrigation—Expert of State Rivers and Water Supply Commission.

Apiculture—Mr. F. R. Beuhne.

Cheese Industry—Mr. G. C. Sawers.

S. S. CAMERON,
Director of Agriculture.

THE WALNUT.

(Continued from page 756, Vol. XII.)

C. F. Cole, Orchard Supervisor,

CULTIVATION.—SOIL TREATMENT.

The amount of soil stirring necessary for a walnut grove to conserve moisture during the drier periods of the year, and to keep the soil in as good a mechanical condition as possible will be controlled largely by climatic and the physical conditions of the soil.

The moisture retaining power varies considerably in soils, evaporation being quicker from some than with others.

Soils that cake upon the surface after rain or artificial waterings generally dry out quicker than those soils of a loose, friable nature that do not do so.

To retain the soil moisture with this former class of soil it is necessary to keep the surface well broken, and in a fine state of tilth during the warm and dry periods of the year. In regions where the rainfall is limited during summer, systematic cultivation should be practised to retain the soil moisture.

Fig. 16.—Partial view of Walnut grove, Eurobin. Mt. Buffalo in background.

During the past summer and autumn of the year, 1914, walnut trees growing in regions that usually receive an abundant rainfall suffered severely from the want of soil moisture. The result is that the nuts were smaller than usual, the meat (kernel) being of poor quality. In many instances a great percentage of the nuts had the meat shrivelled and were valueless. With some trees the whole crop shrivelled and fell. Apart from the trees producing nuts of inferior quality, the foliage suffered sun-burn, and prematurely fell. Such conditions are not conducive to the health of the trees and profitable nut production.

Figure 16 shows portion of a walnut grove planted upon a river flat in a locality usually receiving an abundance of moisture, yet during

The low level of the river also greatly increased the depth of the water table from the natural soil surface. If deep spring ploughing had been carried out, followed up by systematic surface soil stirring, not only would the evaporation of moisture from the soil have been retarded, but the general conditions of the soil greatly improved. Apart from the value of conserving soil moisture, systematic cultivation should be practised in the groves, if not generally through the whole area, then around the trees.

It is a common sight in this State to see walnut trees growing in the most suitable localities showing signs of general debility at an age when they should be vigorous and most productive. Such a condition is brought about, no doubt, not so much from the want of soil moisture, as from the lack of systematic cultivation. The soil, from the want of stirring, becomes sour, and falls back into its natural grass state.

Where the walnut is grown under irrigated conditions the surface soil when sufficiently dry should be stirred and reduced to a fine tilth after each watering. Cultivating soils too soon after watering is harmful, for instead of breaking down the surface soil to a fine tilth the wet soil particles are worked together and become consolidated. The time that soil stirring should follow after waterings will be controlled by the texture of the soil and its water-retaining powers.

Irrigation.

As already stated, to grow the walnut successfully the trees must receive abundant moisture, whether by artificial waterings or natural rainfall. Being a deep-rooted tree, constant irrigation is not necessary. In suitable moist districts where the rainfall is up to the average, sufficient moisture can be retained in the soil by systematic cultivation during the drier periods of the year. Yet even in such moist districts periods of drought are experienced at times, and it is during such dry periods that a supply of water is of great value, not only as an insurance against a poor crop, but it is of the utmost value to the rapid growth and early nut production of young trees. (See Fig. 2*). In warm districts it is useless to think of growing the walnut profitably without irrigation. The period that the trees usually suffer mostly from the want of moisture is from the month of January to early winter. Under normal conditions on irrigable lands heavy waterings should be given during these periods, so that the subsoil will be thoroughly soaked and not allowed to become dry during the autumn and winter months. This insures healthy conditions in the trees, and stores up enough moisture in the subsoil for the following spring and early summer months.

Pruning.

Up to the present time in Victoria there exists a strong opinion amongst persons conversant with the walnut tree that no pruning is necessary, and that the trees should be left entirely to themselves from the time they are planted out permanently, allowing them to form their own symmetrical shape, which shape the walnut has a strong tendency to develop if left alone.

Although the walnut may require very little cutting during its early stages of development, it being only necessary at times to remove a small bough to equally balance and counteract a one-sided growth, it still remains an open question that if systematic light pruning was

* *Journal of Agriculture*, Victoria, August, 1914, p. 457.

practised whether it would not be found profitable, and more beneficial than injurious, particularly to old and fully matured trees. The old adage, that the more one flogged a walnut tree the better it would be, no doubt had its one-time value, although performed and carried out in a very crude manner.

The walnut is a true deciduous tree, *i.e.*, shedding all its foliage in late autumn, and reproducing it again in the spring, carrying it right through the summer months to the following late autumn or early winter. The tree produces two classes of flowers known as the staminate and pistillate, *i.e.*, male and female (see Plate 17). The staminate

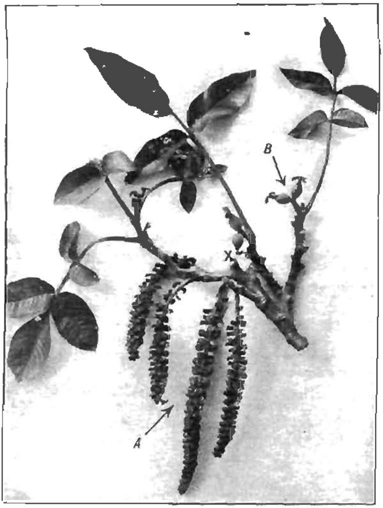


Plate 17.—A. Catkins from first season's growth.
B. Pistillate flowers upon tips of young spring growths.
X. Indicates where growth was cut.

blossoms are borne on long pendulous catkins, which develop in the spring from naked buds formed upon the past season's growth. These catkins contain a light yellowish-coloured fertilizing dust correctly termed pollen, which is carried by the wind and other agencies to the pistillate (female) or fruiting blossoms, which are produced upon the tips of young spring growths, such growths springing from the terminal buds on the previous season's growth. The pistillate bloom or immature nuts contain feathery stigmas that catch the fertilizing dust (pollen), and after pollination has taken place, the feathery stigmas die away,

and the pistillate flowers develop into nuts. Therefore, we find that the nuts are produced upon the tips of the young spring growths alone. This, in other words, means that if a walnut tree is to be prolific it is essential that the tree should make sufficient suitable healthy spring growths each season. If a growth producing the nut or nuts is not injured the terminal bud upon such growth shoots forth during the following spring. Usually this spring growth upon aged trees is less vigorous and much shorter than that upon strong, vigorous and younger trees. Now if this nut-producing growth is broken at the terminal end or cut lightly back after the crop in the autumn or winter months, the results are that one, two, or probably more, of the buds nearest the terminal end of the injured growth are stimulated into action and burst forth, making strong, fresh spring or nut-producing growths the following spring.

Plate 18.—Developing an ill-shaped tree.

Plate 19.—Removal of growth, *correct method.*

No doubt the object of flogging the walnut trees was a rough method of producing upon aged trees a more vigorous and a greater quantity of spring or nut-bearing wood growths, thereby increasing the crop. Many growers still maintain that flogging the tree to harvest the crop has a beneficial effect upon the future season's crop.

X indicates upon Plate 17 where a growth was reduced slightly back upon an aged tree in the autumn of 1913, and by the spring of 1914 there are three nut-producing growths. Experiments carried out by the writer upon portion of an aged tree was favorable to judicious light pruning and thinning out. There is plenty of room for experimenting, both in regards to thinning out the overcrowded growths upon aged trees, cutting lightly back the growths that produce the nuts, and whether annual or longer periods of pruning is the better course to

adopt. If it is proved beyond doubt that judicious pruning is advantageous to the walnut it is questionable if it would be put into practice owing to the great height and size the trees attain under favorable conditions.

Aged debilitated trees that came under the notice of the writer had been judiciously reduced back and were found to have made strong vigorous growths, the rejuvenation of the trees was highly satisfactory. There is little doubt that light pruning and the removal of overcrowded branches is just as beneficial to the walnut tree as to fruit-producing and other trees by stimulating old and forming new growths, and allowing free access of light and air to the inner branches of the trees.

When it is necessary to cut young trees so as to keep them growing in good shape, it is advisable to perform the operation during the early vegetative or active period of the tree—about late spring or early summer. Plate 18 shows a young tree that was reduced back in the winter or dormant months of the tree. The terminal shoot is seen making a somewhat weakly, undesirable oblique growth that if left unremoved would probably be the means of forming an ill-shaped tree. Whilst the lower shoot has come away in a vertical position, making a strong vigorous growth carrying healthy laterals, that will ultimately make strong lateral branches to a fine symmetrical tree.

By cutting away this oblique growth whilst the tree is active, not only is the callusing over of the wound quicker, but the rapid forward growth of the tree in forming its head prevents largely the pushing out of any strong shoots lower down, which very often occurs following winter cutting, and if the lower shoots are neglected probably one will predominate, and making strong rapid growth, will starve those above, and be the means of making an ill-shaped tree.

All shoots that push out below those not required to frame the head should be removed, either with a sharp knife, or rubbed off with the thumb and forefinger, before they reach any length and become hardened. If cutting is practised in the winter, there is a greater risk of upsetting the balance of growth. All cuts should be made neatly and cleanly, and painted over with wax. See Plate 19.

(To be continued.)

Proteins from various sources differ in character, and cannot be regarded as being of equal value in feeding. It is often good policy to mix the feeds.

Bones were first used on Cheshire pastures at the rate of 30 to 35 cwt. per acre. They were broken to 1 inch and ½ inch sizes, but modern science has improved on this.

The colour of superphosphate is a matter of indifference. What the purchaser has to note is the percentage of soluble phosphate, and the mechanical condition.

PLANTING AND RECONSTITUTION OF VINEYARDS.

CONDITIONS GOVERNING THE DISTRIBUTION OF PHYLLOXERA-RESISTANT VINE ROOTLINGS AND CUTTINGS.

In order to guard against misunderstandings, such as have occasionally arisen in the past, concerning the conditions subject to which intending planters of vineyards may purchase phylloxera-resistant vines from the Department of Agriculture, it is deemed advisable, in the present issue of the *Journal*, to clearly state these conditions.

Similar information, published early last year, proved most useful, and was the means of preventing confusion.

It may not be out of place to here remind applicants that the Department is situated very differently from a private nursery firm, which conducts its operations for profit. The propagation and grafting of resistant stocks were undertaken solely in order to help the Victorian vine industry through the phylloxera crisis, by which it was threatened with extinction. Numerous difficulties have had to be surmounted, and considerable sacrifices have been made, vines being supplied to growers at a price which amounts to less than half of what it costs to raise them. In order to prevent disappointment, and to insure the help and co-operation of growers, conditions have been drawn up which intending applicants are earnestly requested to thoroughly familiarize themselves with. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed below, nor can any request for special consideration be entertained.*

While every care will be exercised to supply vines and vine cuttings true to name, no pecuniary liability can be incurred by the Department in the event of possible error. Vines (including cuttings) will only be despatched subject to such reservation.

Resistant vines are supplied to intending planters in either of the following forms, and at the prices stated:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £6.
Resistant rootlings, ungrafted, at per 1,000, £1 10s.
Resistant cuttings, at per 1,000, 15s.

The conditions which applicants have to comply with necessarily vary for each of these. Before detailing them, the two methods by which a vineyard on resistant stocks can be established may be briefly outlined, mainly for the information of settlers in new districts. These are—

I. Field grafting of resistant rootlings, planted the year before.
II. Planting of nursery-raised grafted rootlings or bench grafts.

Field grafting implies the planting of the vineyard with ungrafted rootlings, which are grafted, the year following their plantation, with scions of the vine variety it is desired to obtain fruit from. Sometimes cuttings are planted instead of rootlings, but unless the season be a very favorable one, results are usually disappointing.

Plantation of Grafted Rootlings.—The term "bench graft" is due to the grafting being performed at a bench or table, in a workshop; the resistant cuttings thus grafted with European scions being subsequently callused in artificial heat and struck in a nursery.

Field grafting is the older method. In Europe it has been very largely superseded by the plantation of grafted rootlings, a more even vineyard being thus obtained in climates where a cold Spring is the rule; cold, wet weather causing many field grafts to fail. In the more temperate climate of Northern Victoria far more satisfactory results can be relied on, and field grafting can be confidently recommended to intending planters. Some practical vine-growers who have tried both methods on a large scale claim to have obtained equal, if not better, results from field grafting.

A common fallacy concerning field grafting must here be corrected. It is often thought by intending planters that they gain a season by planting already-grafted vines. This, however, is not the case. The already-grafted vine cannot bear fruit before the third season from plantation. The field grafted vine commences to bear fruit the second season from grafting. If planted on properly prepared land, field grafting can be executed the season following plantation; it therefore follows that such vines will commence to bear the third season from planting, or just as soon as the already-grafted vines, planted at the same time.

Selection of Scions.

Scions for bench-grafting must be supplied by applicants for grafted rootlings, as will be pointed out presently; but it is well to here urge on intending planters the very vital importance of careful selection of scions, whether these be intended for bench or field grafting.

The improvement of the fruit-growing capacity of a variety by means of careful selection of cuttings is no new discovery; it has repeatedly been recommended by different officers of this Department,* and its importance is now very generally recognised. It is a point, however, which was for many years much neglected by the majority of Victorian vine-growers, with the result that several of our vine varieties show more or less marked deterioration in their yield of fruit.

In order to secure prolific scions, the best individual vines in a block of any given variety should be carefully marked—quality and quantity of fruit, as well as general health and vigour, are the essential points to be considered in the selection of these scion-bearing vines, which may best be carried out immediately before vintage. Only fruit-bearing canes on the vines thus selected should be used as scions.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (pink form), (*b*) Ungrafted Rootlings and Cuttings (yellow form). Applications *must be filled in on the proper forms.*

Applications for Grafted Rootlings for Distribution, 1916.

(For the 1915 distribution, the time for receiving applications closed on 31st May, 1914, and present applicants cannot be supplied till 1916.)

1. For the 1916 distribution (June to August inclusive) applications, on the official forms (see above), must be made before 31st May, 1915, after which date they cannot be entertained.

2. Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H. Adcock, Principal Viticultural College, Rutherglen. They must be accompanied by a deposit at the rate of £1 per 1,000 grafted rootlings ordered. In the event of the allotment not being equal to the number applied for, the excess deposit will be applied as a progress payment for those delivered.

3. Scions for grafting, to the number of rootlings applied for and selected as described above, must be delivered by applicants at the Wahgunyah Nursery, or at the Wahgunyah railway station, freight prepaid, between 1st and 30th June, 1915. They must be of medium thickness (minimum diameter at small end ¼ inch and maximum at large end ½ inch), and must be delivered in fresh condition and in good order.

4. On orders for small lots (less than 500 of one scion or stock variety) a surcharge must be paid, to cover cost of extra supervision, of 25 per cent. for lots of 100 and over, and of 50 per cent. for lots below 100.

5. Applicants who supply resistant cuttings (stocks) as well as scions will be entitled to the full number of the grafts which strike.

6. Prior to distribution applicants must submit the land they intend to plant to inspection, as no grafts will be distributed unless the Department is satisfied that they will be planted on properly-prepared land.

7. The number of grafted rootlings applied for will, before being approved, be subject of adjustment after inspection as provided in the next preceding rule, and in the event of the approved number applied for exceeding the number available, distribution will be *pro ratâ* of the adjusted and approved quantities

8. Applicants must pay the balance of purchase money, as specified above, together with cost of packing (of which they will be notified) before the grafts can be forwarded.

9. Applicants must complete the purchase, and either arrange for their vines to be forwarded or take delivery of them at the nursery before the 15th September. Any vines left at the nursery after that date will revert to the Department, and any deposit or purchase money paid on account of same will be forfeited by the applicant.

10. The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, these cannot be supplied to growers in clean districts To do so would be manifestly unfair to owners of existing vineyards in such districts.

Applications for Ungrafted Rootlings.

1. For the 1915 distribution (July and August inclusive) applications will be received until 30th June, 1915.

2 Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H. Adcock, Principal Viticultural College, Rutherglen. They must be made on the official

order forms (see above) and must be accompanied by a deposit at the rate of 10s. per 1,000 ungrafted rootlings ordered. Payment in full at the rate of £1 10s. per 1,000, with cost of packing added, must be made before the vines can be delivered. In the case of such final payment not being made the deposit shall be forfeited.

3. Orders for small lots (under 500 of any one variety) to pay a surcharge of 25 per cent. for lots of 100 and over, and of 50 per cent for smaller lots.

4. Should the number applied for exceed the number available, distribution will be made *pro ratâ*.

5. Applicants must complete the purchase and either arrange for their vines to be forwarded or take delivery of them at the nursery before 15th September. Any vines left at the nursery after that date will revert to the Department, and any deposit or purchase money paid on account of same will be forfeited by the applicant.

6. Rootlings cannot be sent from nurseries in phylloxerated districts to clean districts. A limited number of clean rootlings are, however, available for distribution to clean districts. The price charged is £2 per 1,000, packing extra. Applications for these will be received by Mr. E. E. Pescott, Principal, School of Horticulture, Burnley, until 13th June, 1915.

Applications for Cuttings.

In the event of not being able to purchase sufficient rootlings (grafted or ungrafted), applicants are reminded that cuttings are available. These may be either planted out immediately in the situation which they are intended to permanently occupy, or they may be previously struck in a nursery; the latter is the course recommended. The distribution of resistant cuttings is subject to the following conditions:—

1. In view of the urgent demand for grafted rootlings, no cuttings of sufficient diameter to be grafted are available for sale Resistant cuttings of less than ¼ inch in diameter at the *small end will be supplied at 15s. per 1,000.*
2. Applications for such cuttings, for delivery in July and August, 1915, must be made prior to 30th June, 1915, on the official order forms (see above).
3. Applications may be made to the Director of Agriculture, Department of Agriculture, Melbourne, or to Mr. G. H Adcock, Principal of the Viticultural College, Rutherglen Payment in full, at the rate of 15s. per 1,000, must accompany the order. This amount to be forfeited if delivery is not taken. Where cuttings are required to be sent a long distance and packing is necessary the cost will be advised and must be remitted prior to consignment.
4. Clauses 3, 4, and 5 of the regulations concerning ungrafted rootlings apply also to cuttings.
5. Cuttings from phylloxerated districts cannot be sent to growers in clean districts. A limited number of cuttings are available in districts free from phylloxera, and these can be obtained subject to the conditions specified above, but at the increased price of £1 per 1,000.

SWEET WINES OF MODERATE ALCOHOLIC STRENGH.

By F. de Castella, Government Viticulturist.

A visitor to Australia from Southern Europe cannot fail to be struck by the radical manner in which the requirements of the average Australian wine drinker differ from those of the inhabitants of any of the wine producing countries of Europe.

In France, which is the largest wine consuming country, in Italy, Spain, Portugal, &c., dry wine of low alcoholic strength (from 14 to 18 per cent. proof), often diluted, in the glass, with water, is the usual beverage with meals, just as tea is in Australia.

To the English wine drinker, Spain, Portugal and Italy are best known by their Sherries, Ports, Madeiras, Marsalas, &c., more or less sweet wines of high alcoholic strength. To the inhabitants of the countries where they are produced, however, such wines are practically unknown. They are grown almost exclusively for export, mainly to Great Britain, the types having been evolved to meet the requirements of the cold English climate. It is, perhaps, not generally known that Port is not consumed to any extent in Portugal; the Portuguese drink *Vinho verde*, *Collares*, and other wines more similar to those of France, dry and of low alcoholic strength. Likewise in Spain—Sherry and Malaga are grown and matured for exportation, but light wines, both common, and of better quality such as "Rioja," which are scarcely ever heard of outside of Spain, meet the requirements of the Spaniard, who is, incidentally, one of the most temperate men in the world. In these, and in fact in all the countries of Southern Europe, wherever viticulture is possible, wine is the beverage taken with meals—drinking between meals is the exception, not the rule.

In Australia, the drinking of wine at meal time is quite unusual. Wine is either consumed in the wine shop—between meals—or an occasional glass may be taken at odd times from a bottle supplied by the grocer, often as a tonic prescribed by the doctor. Exact statistics are not available, but it would appear that the wine shop and the grocer retail between them something like 75 per cent. of our total wine consumption, and of this the great bulk is sweet. There is no doubt that the average Australian has a "sweet tooth." To his tea he adds large quantities of sugar, and what little wine be does drink must likewise be sweet. The "Port type" which he mostly favours is made on similar lines to its well-known European prototype. In this and such wines as Muscat, Frontignac, &c., the characteristic sweetness is due to a remnant of grape sugar, the fermentation of which has been prevented by the addition of sufficient wine spirit to increase the strength to a point at which further fermentation is impossible. In other words, sweetness is retained by "impounding" a certain proportion of the natural sugar of the grape by adding wine spirit, before the completion of fermentation. The alcoholic strength of such wines is necessarily considerable, rendering them, in the opinion of hygienists, less suited for consumption in our warm climate than in colder Britain.

French authorities distinguish between *Vins de Liqueur*—in which the alcohol is partly added—in short, fortified wines, and *Vins Liquoreux*, containing a more or less considerable quantity of grape sugar which has escaped fermentation, and a proportion of alcohol, wholly derived from the transformation of the sugar of the original must—in other words, unfortified sweet wines.

The part of mentor is always a thankless one, especially in regard to what one eats or drinks; nor is it desired to in any way discredit the sweet wines we now so largely produce. One might as well condemn the celebrated Ports of the Alto Douro (Portugal), recognised by all competent judges to rank amongst the world's finest wines. In Victoria we have produced, and are still producing, admirable wines of this and similar types—wines which are in no way less wholesome than the most celebrated Port. If the demand for such wines is keen—a heritage, no doubt, from our English forefathers—it is but legitimate business to supply such a demand.

The object of the present article is to draw the attention of our wine-makers to a few European sweet wines which belong to another class. They are quite distinct from the sweet wines we most largely produce in Australia; and are of far lower alcoholic strength than Ports and Sherries, and consequently better suited for extensive consumption in a warm climate such as ours.

They present another important advantage, that of being more economical to produce. Every additional degree of alcoholic strength means a corresponding increase in the cost of production. A wine of a strength of, say, 33 per cent. (proof) costs, roughly, 50 per cent. more to make than one of 22 per cent. In other words, a ton of grapes capable of yielding 120 gallons of wine at 22 per cent. would only yield 80 gallons if made at 33 per cent. In the latter case, a portion of the wine first made would need to be distilled, the spirit derived therefrom being used to increase the strength of the balance. If the 33 per cent. wine were sweeter than that at 22 per cent., the yield per ton would be still further reduced.

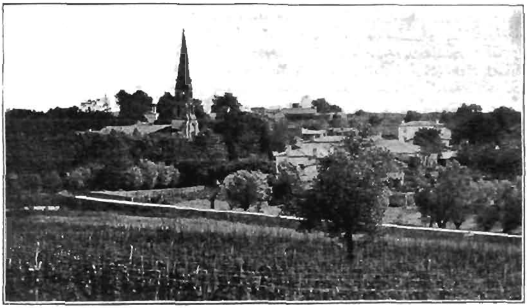
The advantages outlined above are such that the production of these moderately alcoholic sweet wines undoubtedly constitutes a potential field, at least worthy of serious consideration and experimentation—a field which, curiously enough, has scarcely as yet been exploited by us, though it can undoubtedly provide the means of satisfying the demand for sweetness so strongly evident in Australia, whilst supplying a wine of considerably lower alcoholic strength than is possible in the case of Port and other kindred types.

Some twenty years ago sweet wines of fairly moderate strength were often met with in the retail trade, in which fermentation was stopped, and the sugar necessary for sweetness was impounded by means of salicylic acid. Such wines were, in fact, very largely sold, and they appear to have given complete satisfaction. The prohibition of salicylic acid—an absolutely necessary step, and one which has been forced on every civilized wine country through the injury to health caused by the drug—has led to the disappearance from the market of nearly all wines which used to be classed as "Sweet delicate," and their substitution by so-called Ports, Madeiras, and Muscats as already described.

Such wines of the bad old salicylic days are only mentioned here, since they prove that it is the sweetness rather than the alcohol of our present-day sweet wines which causes them to be so widely appreciated, and that if wines of similar character, but which do not infringe our pure wine laws, can once more be placed on the market, they will again be favorably received by the wine-drinking public.

Some European Sweet Wines.

Many sweet wines, of several totally distinct types, are made in the different European wine countries, a lengthy enumeration of which is not here possible, and would only lead to confusion. Those which interest us here, on account of their low alcoholic strength, are made chiefly in France, and, with the exception of Sauternes, which has a world-wide reputation, they are consumed in that country, being but little known outside of it. In this they differ radically from the familiar sweet wines of the Peninsula, grown mainly for exportation.



Village of Sauternes.

Among the sweet wines of France we have, first and foremost, Sauternes, the well-known golden yellow wine, varying, according to vintage, from almost dry to quite sweet. This is held by French connoisseurs to be the king of fruity white wines, a contention which receives strong support from the very high prices the choicest growths are able to command in the world's markets. The methods followed in the growing, making, and maturing of this remarkable wine present so many interesting peculiarities that a brief summary of them will prove of interest.

Sauternes is situated south-east of Bordeaux. As will be seen from the view here reproduced it is quite a small village, but it has given its name to the surrounding district, which, though not a large one, is celebrated for the quality and unique type of the wines grown. A view is also reproduced of Château Yquem, the most celebrated vineyard in

the Sauternes district. The vines from which these wines are made are Semillon and White Sauvignon—about 75 per cent. of the former to 25 per cent. of the latter—the two grapes being blended before fermentation. The wines which have rendered this region famous are, like many of those belonging to the category of unfortified sweet, produced with the help of *Pourriture Noble* (noble rot), the name commonly given in France to *Botrytis Cinerea*, the grey mould which so readily develops on grapes in a rainy autumn. Though this fungus is fatal to the quality of red wines, in which it brings about the disease known as "Casse," it is largely responsible for the extraordinary quality of the white wines of Sauternes and several other choice European districts. In fact, a good vintage is one when mould is very prevalent. The vines are gone over several times, all mouldy grapes being picked first. The Botrytis fungus acts in several ways, but mainly by rendering the skin thinner, thus facilitating evaporation and resulting in increased gravity of the must.

"In good years the concentration of the choicest musts may vary from 14 deg. to 30 deg. Beaumé. *Botrytis Cinerea* mainly consumes sugar and acid, but the acid is attacked in greater proportion than the sugar, so that the natural concentration results in the gravity increasing without the acidity exceeding a normal proportion. The action of the mould may be compared to exaggerated ripening. The physiological action also results in the production of several secretions—glycerine in notable quantity, mucilage, and finally oxidase in abundance, the effects of which on the wine must be combated by energetic sulphuring.

Fermentation of the very rich musts is slow, especially if the autumn be cold, the complete cessation of fermentation only taking place in January or February (July or August in Australia). The first racking is accompanied by a fairly heavy sulphuring to prevent any fresh start of fermentation, which would be detrimental to quality, causing the wine to lose sugar, and tend towards Maderisation.* In the best vineyards the wine is blended to an even standard at the first racking. The wine is racked every three or four months and sulphured each time. With the further aid of several finings, preservation and perfect clarification is secured, rendering the wines fit for bottling, which does not take place until it has spent two or three years in the wood.

Sauternes is soon ready for sale, cask age having given it the necessary qualities. The greater the initial gravity of the must the more does the wine improve with age. If intended for long keeping it must contain enough sulphurous acid, when bottled, to prevent a slow but sure oxidation, which would render the wine brown instead of golden, and develop a rancid taste. Sauternes which has become *Maderisé* is considered to have lost its choicest qualities.†

The following analysis of Château Yquem wines will convey some idea of the type, the leading features of which are low alcoholic strength—remarkably low, in fact, for sweet wine—a variable but considerable percentage of sugar, and a high proportion of sulphurous acid. Sauternes is, in fact, a type of wine the production of which would be impossible without the use of SO_2. Another interesting feature shown is the great preponderance of levulose over dextrose.

* Maderisation is the name given in France to an oxidation phenomen, akin to "Casse," which results in white wine assuming a more or less brown colour, and taking on a character reminding one of Madeira.

† See Laborde—*Les vins blancs liquoreux*—in *La revue de Viticulture*, 13th February, 1913.

ANALYSES OF CHÂTEAU YQUEM WINES.

Vintage.	1874.	1880.	1889.	1893.	1894.	1896.	1898
Proof Spirit .. .. per cent.	26·1	23·5	20·5	22·4	23·8	23·2	24·4
Reducing Sugar (as invert sugar) ..	8·208	2·292	·733	8·27	1·322	6·47	·982
Dextrose	1·938	·698	·232	2·605	·486	1·486	·234
Levulose	6·27	1·594	501	5·665	·836	4·984	·748
Ash	·327	·296	·230	489	·392	·365	·372
Acid—Total as Tartaric	·682	1 086	·592	786	·719	·734	·655
,, Volatile as Acetic	·54	·12	·13	·12	·93	·11	·11
SO_2 Free .. M'grams per litre	12	25	43	154	110	92	43
Total	179	179	179	604*	330	346	225

See X. Rocques Revue de Viticulture, Vol. XVI., p 174

The Muscats, of which the best known are those of Lunel, Frontignan, and Rivesaltes, deserve special mention. These differ from our Australian Muscats, which are more similar to those of Spain and Portugal, in their greater delicacy, or as those who prefer our Muscats would say, less pronounced character, due to their being made from the white, instead of the brown, variety of muscat. They differ even more from ours in their lower alcohol content, as will be seen from the following analysis of two samples brought from France by the writer in 1908:—

—		Muscat de Frontignan.	
		Vintage 1896.	Vintage 1897.
Alcohol	per cent. proof	26·45	25·75
Total sugar (after inversion) ..	.. per cent.	2·54	2·16
Sugar free extract	.. ..	·36	·18
Ash	.. ..	0·28	·024
Sulphates (as K_2SO_4)	Grms. per litre	1·43	1·55
SO_2 Mgrms. per litre total ..	.. ..	35·	25·
,, free	.. ..	3·	3·
Acidity—Total (as tartaric) ..	.. per cent.	0·36	0·34
,, Volatile (as acetic) ..	.. ..	0·05	0·04

Examination for prohibited preservatives and sweetening substances gave negative results.

In spite of their moderate spirit strength and far from high SO_2 content, these wines stood the voyage perfectly, arriving in excellent condition, which they retained during the year they were kept under observation. French muscats are made from over-ripe grapes; they are fermented slowly in small volumes at low temperature. Such conditions differ widely from those under which our wine-makers are compelled to work in Northern Victoria. The method followed, though interesting, would need much modification to meet our requirements.

* It is noteworthy that this wine contains more total SO_2 than is permitted by French law. The samples of '94 '96, and '98 wines, though complying with the French law, contain more SO_2 than Victorian legislation permits.

A very interesting type of light, sweet wine is that to which belong *Clairette de Die* and *Blanquette de Limoux*, wines held in high esteem in the neighbourhood of the localities where they are produced. These wines, which are chiefly intended for local sale, are distinctly sweet; they contain relatively little alcohol, and are more or less sparkling. This last characteristic is not a necessary one, and the method which permits the retention of sweetness may equally well be applied to dry wines. In brief, it consists in the carrying out during fermentation of several skimmings and filtrations, so as to remove as much yeast as possible. The aeration accompanying each filtration stimulates the growth of a fresh crop of yeast, which is again removed by a fresh filtration. Such exaggerated but futile yeast production impoverishes the must until a stage is reached when fermentation can no longer continue. So efficient is the method that it permits of the making of wines retaining 2 to 3 per cent. of sugar, and over, which remain in perfect condition at an alcoholic strength of about 15 per cent. proof, and even less. The process is, in fact, similar to that which permits the retention of sweetness in cider, of even lower alcoholic strength.

Another sweet wine which belongs to this class is the celebrated Tokaj or Tokay, grown on the slopes of the Hegyalja hills, south of the Carpathians, in Hungary, which undoubtedly ranks as one of the very choicest sweet wines. Though of moderate alcoholic strength (usually from 21½ to 26 per cent. proof), it differs mainly from Sauternes, in that SO_2 is very sparingly used in its making—a fact which is evidenced by its deeper colour (Tokay is brown, whilst Sauternes is golden).

There are several varieties of Tokay, differing considerably in strength and sweetness, but possessing the common property of remarkable fragrance; they vary from slightly fruity to extraordinarily sweet.*

The process followed in the making of these remarkable wines is somewhat complicated; it is mainly based on over-maturity, a considerable proportion, and, indeed, sometimes the whole, of the grapes being quite shrivelled, or *Asszu*, as it is termed in Hungarian, before being vintaged. Fermentation is conducted very slowly, at a low temperature.

---

* J. Laborde, in an article on Tokay (see *Revue de Viticulture*, 31st July, 1913) gives analyses of five distinct types. *The following extracts will give some idea of the great variability in composition.* The types represented are the following:—

No. 1. Ordinary table wine of Tokay-Hegyalja; made without shrivelled grapes. Tarczal, vintage 1901.

No. 2. *Szamorodni*, made from slightly shrivelled grapes, but only slightly sweet—less so than the following. Sarospatok, vintage 1901.

No. 3. *Asszu*, five tubs. The number of tubs indicates the proportion of shrivelled, or *Asszu*, grapes which has been added to a hogshead of must, and consequently, the degree of sweetness. Tarczal, vintage 1901.

No. 4. *Asszu*, four tubs. Tallya vintage 1890.

No. 5. *Essence, or wine made entirely from shrivelled grapes.* Tolcsva, vintage 1901.

		I.	II.	III.	IV.	V.
Alcohol	per cent. proof	25·2	25·9	21·4	23·0	12·5
Total acidity	per cent. as tartaric	0·76	0·94	0·96	0·62	1·23
Volatile acidity	per cent. as acetic	0·13	0·10	0·15	..	0·21
Extract	per cent.	3·16	7·78	18·74	9·26	33·73
Reducing substances (sugar)	per cent.	0·29	2·6	13·4	5·75	25·77
Levulose	per cent.	0·16	1·82	6·95	2·88	13·9
Dextrose	per cent.	0·03	0·68	6·45	2·77	11·87
Glycerine (natural)	per cent.	1·08	1·48	1·8	..	1·45
Tanin	per cent.	0·02	0·015	0·03	..	0·024
Polariscope deviation		−0°14	−1°38	−3°15	−1°30	−7°04

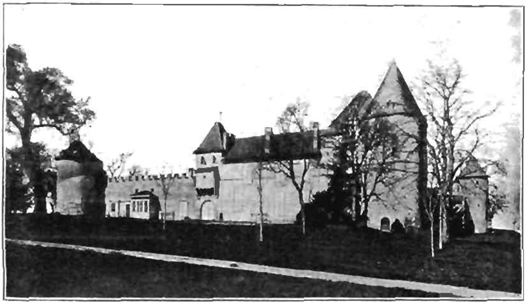
No. V., with nearly 26 per cent. of sugar, is almost a syrup, yet its low alcohol strength of 12½ per cent. proof suffices to keep it sound, and this without SO_2. Tokay, it is needless to state, contains no other preservative.

We cannot here examine the process in detail, nor would it be very profitable to do so, seeing the great difference between Australian conditions and those which prevail in Hungary.

Many other sweet wines might be cited—the Italian Asti, somewhat similar to *Clairette de Die;* the *Rancios,* of Banyuls and Collioure, in the French Pyrenees, and numerous others, but the types mentioned above will suffice.

Theoretical Aspect.

Sweet wines are made by withholding from fermentation a portion of the natural sugar of the must. This may be achieved in various ways, the addition of an antiseptic being the most convenient. In the case of fortified wines, alcohol itself is the antiseptic employed. Supplementing the natural strength by artificial addition—in other words, fortification to 18 to 20 per cent. by volume (32 to 35 per cent. proof), at which strength yeast action is no longer possible—is the method by



Chateau Yquem.

which Port and other kindred wines are made. We have seen how salicylic acid was used for the same purpose until its further use was prohibited. Any other tasteless antiseptic would serve equally well, were it not that all antiseptics, with the single exception of sulphurous acid (SO_2), have properly been banished from the wine cellar by pure food legislation. Even this agent, which has been employed in wine-making since the time of ancient Rome, is now subject to rigorous control; nevertheless we have, in its judicious use within legal limits, a means of sweet-wine production which has rendered possible the evolution of Sauternes and several other wines.

The same object may be attained by other means—over-maturity, for instance. Grape sugar, or, as it is usually termed, glucose, is in reality a mixture of two very similar sugars; they are identical in percentage chemical composition, as is shown by their common empirical formula, $C_6H_{12}O_6$, but differ in their physical properties. Examined

in the polariscope, a solution of one of these deflects the polarized ray to the right, whilst in the case of the other it is turned to the left; hence the terms dextrose and levulose, by which they are respectively known. They are also differently acted upon by yeast. It is true that different yeast organisms show some variability in this respect, but, in a general way, dextrose undergoes alcoholic fermentation much more readily than levulose. In the juice of grapes which have just reached maturity the proportion of each sugar is about equal, but in that of over-ripe grapes levulose is the more plentiful. Hence it is that the juice of over-ripe grapes is more difficult to ferment completely than that of grapes which are just ripe, and no more. Practically all unfortified sweet wines are made from over-ripe grapes, notably Tokay, French Muscats, and Sauternes. More particularly in the case of those where concentration is carried furthest, as, for example, in Tokay "Essence," it is remarkable how the wine maintains its condition at a low alcohol strength, and this without sulphuring, such as is characteristic of Sauternes. Sugar itself, especially with the help of a little alcohol, seems to act as an antiseptic, once a certain stage of concentration is reached—much in the same way that jams are protected from further change by the use of sugar alone. In all such wines, where the aid of SO_2 is not had recourse to, slow fermentation at low temperature is absolutely essential to success.

Then we have what may be termed the "yeast starvation" method employed in the case of *Clairette de Die* and some other wines. In a previous article* recommending the use of Ammonium Phosphate as a yeast stimulant in sluggish fermentations when a dry wine is the objective, it was pointed out how yeast, in aerobic development—in other words, growing in presence of much air—reproduces itself much more abundantly, but possesses less fermental power than the same yeast in the absence of air, or in anaerobic life. The larger crop of yeast naturally makes greater demands on the stock of assimilable nitrogen and phosphoric acid in the fermenting medium—elements which are not abundant in grape juice. The case now under review is the exact opposite of the one previously considered, but the same principle applies, the very yeast starvation which often hinders the production of a dry wine being turned to useful account in the making of a light, sweet wine. The yeast starvation is brought about by the removal of nitrogen and phosphoric acid, the yeast itself being the agent employed to effect such removal. Though *Clairette de Die* and *Blanquette de Limoux* have been made for centuries, the scientific principles underlying their manufacture were first explained in a report to the Agricultural Society of the Drome Department (France) by MM. L. Roos and J. Rolland, in 1902.

We have thus three quite distinct principles, the practical application of which will enable us to make unfortified sweet wine. These are:—

(*a*) Over-maturity of the grapes (fermentation at low temperature being absolutely essential).
(*b*) Yeast starvation.
(*c*) Addition of SO_2

* See *Journal of the Department of Agriculture*, April, 1909.

In practice, one alone of these is rarely depended on; it is a combination of two, or even of the whole three, which is more usual. Nevertheless, one of these principles generally overshadows the others in the making of any particular sweet wine. Tokay is almost entirely based on the first, Clairette de Die on the second, and Sauternes on the third.

PRACTICAL HINTS.

Under the climatic conditions which prevail during vintage in Northern Victoria, a combination of the three above-mentioned principles is strongly recommended. The grapes intended for unfortified sweet wine should not be vintaged until over-ripe;* yeast starvation is then brought about by filtering, followed by aeration, and further fermentation prevented and permanent condition secured by the addition of SO_2. It is, no doubt, possible to dispense with filtration and preserve sweetness by the use of SO_2 alone, but the quantity required would be much more considerable; hence the advisability of combining the three methods.

The gravity of the must should be at least 16 deg. Beaumé; satisfactory results will not be obtained so easily below this. Very complete yeast starvation brought about by repeated filtration will, however, permit of sweet wines being made from musts of lower gravity.

Fermentation should be carried out in small bulk, preferably in hogsheads, and temperature must be carefully controlled, 75 deg. F. being the limit which cannot safely be exceeded. If too active it may be checked by adding bisulphite of potash, a record being kept of each addition, with a view to guarding against the legal limit being exceeded.

As regards yeast starvation: Though frequent skimming can remove a good deal of yeast, filtration is far more effectual. A pulp filter is to be preferred. The object being only to remove the greater part of the yeast, complete clarification is not necessary; hence the pulp need not be packed very tightly. This is fortunate, as, owing to its viscosity and the presence of bubbles of CO_2, fermenting must passes slowly through the filter. Filtration must be followed by aeration to stimulate fresh yeast growth; a bicycle foot pump, attached by a rubber tube to a block tin or gun-metal pipe, is very convenient for the purpose. Two to three aerations at six to eight hours' interval should suffice. The number of filtrations cannot be absolutely fixed. Experimentation in each locality can alone decide. In a general way, two filtrations will usually lead to such a reduction in the activity of fermentation that a small addition of bisulphite will cause it to cease altogether.

The first filtration should not be carried out too soon—not until there has been considerable yeast production. Prior to this it may be advisable to aerate, but as a rule fermentation will be sufficiently active without it. In the case of a must with an original gravity of 16 deg. Beaumé, the first filtration may be given when this has fallen to 11 deg. or 12 deg., and the second when it stands at 5 deg. or 6 deg. Here, again, the figures cannot be rigorously fixed; the treatment will depend on the rate of fermentation and the degree of sweetness desired.

* In seasons when grapes will not become sufficiently overripe if left hanging on the vine, partla drying, on raisin trays in the sun, for a couple of days, may be resorted to. This procedure is usual in Jerez (Spain), where grapes are exposed on esparto mats in the *almijar* (an open courtyard).

The dose of SO_2 and the best time to apply it also vary; they are chiefly governed by the amount of filtration which has been practised. The more frequent and thorough this has been, the less SO_2 will be needed. If filtration is dispensed with, heavy doses will be necessary; probably to near the limit allowed by law. This limit, according to our Wine Adulteration Act, is 20 centigrammes of total SO_2 per litre—in other words, a shade over 3½ oz. per 100 gallons, a quantity which would be contained in 7 oz. of good commercial bisulphite of potash (50 per cent. of SO_2). These figures will give an idea as to the quantity which may be safely used and the total which must not be exceeded. It must be remembered that a heavily-sulphited wine is not immediately marketable, since it would exceed the limit allowed for free SO_2 (one-tenth of the allowance of total SO_2) until the bulk of it has gone into the combined state—a change which will have come about within a few months after addition.*

It must be remembered that the object in view being actually the reverse of a dry wine, the procedure must be radically different from sulphiting in the ordinary way. In that connexion the addition of the whole dose of SO_2 before the start of fermentation was strongly recommended. In the case of sweet wines, on the contrary, such early additions would be most ill-advised. SO_2 should be added progressively as fermentation proceeds, in small quantities at a time, as may prove necessary to moderate and control it.

The type of wine which it is desired to make must be considered. If this is to be of fairly deep colour, with Rancio or Madeira character, yeast starvation must be mainly resorted to, and SO_2 used sparingly, if at all. If, on the other hand, a golden colour and more delicate character is preferred, then SO_2 must be freely used.

Conclusion.

It must not be imagined that by the above, or, in fact, any treatment, common must can be converted into anything even distantly resembling some of the very high-grade wines mentioned above. Such wines as Sauternes and Tokay are inimitable; they owe their wonderful quality to a fortunate combination of natural circumstances, and science has proved powerless to grow anything similar outside of the vineyards privileged by Nature to produce them. The aim of the present article is something much more modest, though it is something which has not been extensively attempted in Australia as yet. The writer is hopeful that, by the application of the methods outlined above, the object proposed at the outset can be satisfactorily achieved, namely, the production of sound, wholesome sweet wines of moderate alcoholic strength, such as are sure to meet with a ready demand on our local market, and of which larger quantities could safely be consumed than of the present type of fortified sweet wine. Experiments conducted within the past few years leave no doubt as to the feasibility of the making of such wine on a large scale and under Victorian climatic conditions.

---

* Even after a few months, however, the whole of the added SO_2 will not be present as "Total" i.e., free and combined, for the reason that part of it b comes oxidised to sulphuric acid. This will be found in the form of sulphate of Potash. It is quite safe to use SO_2 right up to the legal limit, provided the addition is made a sufficient time before the wine is offered for sale.

SOME USEFUL HINTS ABOUT MILKING THE COW.

By R. R. Kerr, Dairy Supervisor.

In the minds of most people, including many dairymen, very little thought or attention is given to the milking of a cow. Many of the failures at dairying are due to a lack of knowledge of this important subject, and when that is missing, the cows soon feel and show the results. They gradually go dry, and, with poor returns, dairying is branded an unprofitable industry, and the cows as duffers. What constitutes a good milker, or by what method a man can get the utmost from a cow—leaving out the question of feed—is a matter too often neglected. I regret to state that the milking of cows on many dairy farms seems to be a secondary consideration, the apparent object being to get the cows out of the yard as soon as possible. Now, while it is necessary that cows should be milked quickly, they must not be rushed through.

A large majority of our best cows are of a sensitive nature, and not at all suited to the methods of learners. The old idea that any one could milk a cow is all moonshine, as some milkers can get far better results than others. Many experiments have proved this, and it is common knowledge with our experienced and successful dairyman; consequently it pays to give the right man a higher salary. In nearly all the older dairying countries of the world, most of the milking is done by the women folk, who posses inherently gentle methods of handling animals—one of the most important items in successful dairy farming. There seems to be some prejudice against girls doing dairy work, but, to my mind, when the conditions are sanitary and comfortable, they would be far better off in the open air and sunshine than in many of the occupations now sought by them. Where there is specialization in dairying, and the individuality of the animals is studied, the drudgery is removed, and the dairy cow becomes an interesting study and worth far more consideration and care than is generally given her. Many of our best cows produce over ten times their own weight of the most digestible food, and leave progeny to do likewise. No other farm animal does so much. The racehorse is given every care and preparation for the chance of winning a race; surely the good cow is worthy of the like consideration, so that her years of usefulness may be prolonged. A common question, asked by many dairymen when employing a milker, is, "How many cows can you milk in an hour?" Many exaggerated answers are given. The steady, reliable milker is worth all the cracks, and if a man averages eight or nine cows an hour in the spring months he is not losing much time, although odd men can do more.

The old question, wet versus dry milking, is a perennial topic, and much could be written on the subject. Bacteriological examinations have proved that dry milking is more cleanly, but where the cow's udders are well wiped, and the milker's hands regularly washed, some advantage can be claimed for the wet method, which is the more common in the State, although the hands should be moist—not actually wet, and moist teats are an aid to a milker in stripping a cow. Wet milking without the washing of the udders and the milker's hands is a filthy practice. It is well known that the last milk drawn from the udder is

much richer in fat than that taken at first. This is one of the reasons why the milker should secure all the milk, but the most important is that it encourages the cow to produce more milk. In their natural state cows produce just sufficient milk to nourish their young; they soon find out their requirements, but domestication has achieved a wonderful change, and the cow is now much like a machine. For generations the young animal at birth has been removed, and all the milk the cow could produce taken. These practices give us the wonderful dairy cows of to-day. If cows are not milked dry they soon become accustomed to such treatment, and keep on decreasing their yield until ultimately they cease to yield at all. Learners never should be allowed to milk good, full milk cows; it is much better to let them practice on the strippers, or some cow of little value, as their methods soon upset a good cow. Weak-wristed persons do not make good milkers, as most cows need a good, strong milker, with his full hand. Thumb and finger milking should be avoided whenever possible; the proper method is to squeeze the teat and slightly pull it. Many young heifers have their teats ruined by unnecessary dragging with the thumb and finger; it injures the inside of the teat, causing what is commonly called a pea in the teat. The young heifer needs very gentle pressure; if too forceable methods are employed, she becomes frightened and starts to kick, and then one can be sure that the best results are not being obtained; her teats are sensible to pain, and the milking hurts her. Take plenty of time to milk such a cow, and see that the finger nails are cut close. When she is first bailed or penned, let her stand a time, to get accustomed to her surroundings. Any ill-treatment at this stage will in most cases ruin her for all time.

Very few cows can be completely finished by milking with the full hand, and when the main flow has ceased; to strip the cow, it becomes necessary to gently press a quarter with one hand, and milk with the other, thus drawing the udder.

A cow, once started, should be always finished without interruption; the milker's mind must be centred on his work to gain the sympathy of the animal; dilatory or slow milking, talking and noise-making should be avoided—such actions cause a decreased flow. Where milking machines are used, the cows should be first tried for udder troubles and stripped immediately the machines are removed; any time elapsing between generally results in the cow holding back the last and richest of her milk. This is the cause of many of the complaints about milking machines being unsatisfactory, as the cow soon becomes dry—really the fault of the operator. If an animal does not let her milk down freely to the machine, do not persist in its use, as such persistency will surely cause her to go dry. It is much better to milk such a cow by hand, or any other whose udder conformation does not lend itself to easy milking; very large teats with a hard skin are unsuitable. Best results may be obtained from cows with low hanging udders by the attendants using a very low stool and keeping the arms on a level with the teats.

Approach the cows gently. It is desirable that the usual attendant attach the teat cups on the first occasion. The cow is governed by habit, and most cows dread a new milker. In cold weather, provide warm water to insert the teat cups in, and wash the udders.

While the milking machine, in the care of an intelligent man, may solve the labour problem, it will do endless damage in the hands of a *careless operator. The cleanest and purest milk* can be obtained by machines, if properly handled. Do not wash the udders too far in advance of the machine, as the cow will have taken her milk up again; she should be milked immediately after the washing and drying, when her teats will be full of milk; then the machine will do its work more effectively and quickly.

One hears much about the near and off side of a cow or the milking side. We milk cows on both sides, and the proper term to use is the right or left side. When a cow has a weak quarter, milk that teat first, to encourage more milk to come into it; a good rubbing is also beneficial. One should at all times endeavour to keep the cow's udder well balanced; this can be accomplished or maintained by partially milking the two fore teats, then likewise the rear teats, then completing the milking at the next exchange. If an animal suffers from sore teats, endeavour to get the sore in the palm of your hand. Sore-teated cows stand more easily to machine milking. Better results will be obtained if sick and injured cows are always milked by the same milker. Tough cows are more easily milked by putting nearly all the pressure near the point of the teat, but animals of this class seldom pay to keep, unless they are exceptionally good. The insertion of any instrument into the teat generally ends by the cow losing the quarter, despite all care. The dairyman must understand the different individuals in the herd and humour them to get the best results; it is no use trying to force a cow against her will. Some cows will not give their milk if allowed to remain too long in the bails; others, again, only give their milk freely to particular attendants. One fault of feeding cows during milking is that the animals often get the habit of only giving their milk when feeding; it is much better to feed them before milking, although a very nervous animal will do better if fed during the milking—she generally stands quieter. Never feed strong-smelling foods just prior to milking, as they are apt to taint the milk. Strangers in the shed during milking hours often upset the cows. Any handling of the animals should be done after the milking.

Many of the dairymen are greatly troubled in the spring months by the low butter fat tests of their herds; while admitting that poor testing cows are the greatest cause, the period between the milkings is often a considerable factor in reducing the percentage of fat of any particular milking. The shorter the period between the milkings, the richer *the milk; this is found in the evening's milk, which is nearly* always the richer, as less time elapses between the morning's and evening's milkings than between the night's and morning's. It is the morning's milk that has the low fat percentage; the cow then has her greatest flow of milk. Taking an average, the cows would have fifteen hours' milk in the morning, and nine in the evening; in some instances greater variations occur. When the periods are more evenly distributed the tests are more uniform and the cows *do not suffer from distended* udders, or overstocking, as it is generally termed. This, besides being cruel, often results in injured udders. All cows suffering from sickness should be milked last, or, better still, isolated, as this reduces the danger

of infection and gives more time to attend to their wants. Injured and sore-teated cows should be treated in the same manner. Any man is very foolish to rush his cows about or ill-treat them in any way. While dogs may be all right in some cases, when properly handled, they are much better away from milking cows, who are ever in constant fear of them. The placing of a large number of cows in a small yard is often another source of trouble; they generally horn one another and inflict serious injuries. That is where polled cows come in—they stand much quieter and cannot hurt each other. Remember always that any bad treatment of the dairy cow has an immediate effect on the milk flow.

Have a water trough in the cow yard. Bring the animals in later in the evenings during the hot weather; they will be more contented. Keep them warm in winter; they are more easily milked, and it benefits the animal and economises feed.

Cows should be dried off gradually. When they are hand-fed, the feed can be regulated in most cases to accomplish this, but when cows are on good pasture it is much harder, and many good ones milk right through to the next calving—to force them dry would be to ruin their udders. Let them be milked once a day for a start, then every day or so, not necessarily milking them dry. When it is apparent that a cow will not go dry before recalving, feed her the most nourishing food, to help rebuild the cell system of the udder. When the animals are in good condition they do not need a long spell, about six weeks being sufficient, but if low in condition, much longer will be needed. No spell means a decreased production the following lactation period. It is penny wise and pound foolish to allow the dry cows to lose condition; it not only weakens their constitutions and makes them more susceptible to disease, but it also weakens the unborn calf, which might be your future dairy cow.

One point remains to be mentioned, and it is an important one. Many men over-confident in their knowledge pass poor judgment on animals that do not conform to their ideals. While they might pick out the best-looking animal, they do not choose the most profitable with any surety. These profitable cows are included in all breeds, within no strictly defined lines, and are only discovered by the recording of the milk yields and the percentage of butter fat contained therein.

The observations mentioned herein have been gained by a long experience amongst dairy animals, and while the opinions expressed may not be infallible, they are mostly based upon actual fact, and contain some hints that will be useful to any beginner in dairy farming.

CORRECTION.

Wheat Exhibits, Royal Agricultural Society's Show.

In the December issue of this Journal it was wrongly stated that the second prize for the low-strength wheat section was awarded to J. B. Schulze, of Dimboola, with a sample of King's Early. The second prize was won by P. Haudreck, Moutajup, with an exhibit of Yandilla King.—Editor.

STANDARD TEST COWS.

Report for Quarter Ending 31st December, 1914.

Of the total cows completing their terms during the currency of the quarter under review, 25 qualified for certificates.

One new herd (Jersey), that of Mr. C. E. Wood, Frankston, entered during the period.

It is noteworthy that last season's record of 585¼ lbs. butter-fat, which was put up by Mr. Brisbane's Scottish Queen of Gowrie Park, has now been exceeded by the same owner's Ida of Gowrie Park—last year's runner-up. Individual returns are as follow:—

Mrs. B. M. BECKWITH, Malvern. (Dexter Kerry).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Killow	Not yet allotted	5.2.14	12.2.14	273	16¼	5,658	4·62	261·64	250	298¼

W. P. BRISBANE, Weerite. (Ayrshire).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Ida of Gowrie Park	2,423	14.3.14	21.3.14	273	26¼	11,917¾	5·08	605·05	250	689¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Polls).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Samorna ..	Not yet allotted	26.2.14	5.3.14	273	14	4,397½	4·82	212·07	175	241¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire).

Completed since last report, 7. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
sy Maid of Spar-rovale	2,510	13.1.14	20.1.14	273	7½	4,411¼	4·32	190·63	175	217¼
eet Flower of Glen Elgin	1,844	5.3.14	12.3.14	220	4	5,681	4·61	261·71	250	298½

A. W. JONES, St. Albans. (Jersey).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
dy Gray IV. ..	Not yet allotted	7.2.14	14.2.14	273	19	7,250¼	5·76	417·78	25[illegible]	476¼

C. G. KNIGHT, Cobram. (Jersey).

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
s Twylish ..	2,369	24.1.14	31.1.14	*231	14½	3,881¾	6·46	250·73	200	285¾
tletoe ..	2,984	4.2.14	11.2.14	273	17½	5,888¾	5·01	295·09	175	336½

* Sold 42 days before term expired.

C. D. LLOYD, Caulfield. (Jersey).

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
een	2,976	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]38	206·26	175	303¼

LIBRARY
TNAU, Coimbatore - 3

C. GORDON LYON, Heidelberg. (Jersey).

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Silvermine V. ..	1,386	27.12.13	3.1.14	273	28½	5,515¾	5·12	282·40	250	322
Silver Pride ..	1,387	29.12.13	5.1.14	273	18½	*6,097¼	4·70	286·53	200	326¾
Silver Audrey ..	1,378	30.12.13	6.1.14	273	15½	6,128½	4·98	305·38	200	348
Silvermine III. ..	715	9.1.14	16.1.14	273	26½	8,266½	5·16	426·31	250	486
Hawthorn ..	1,064	4.3.14	11.3.14	273	21	7,585¼	5·16	391·55	250	446¾
Hawthorn II. ..	Not yet allotted	6.3.14	13.3.14	273	9	4,205¾	5·35	225·16	175	256¾

* Sickness for seven days affected yield.

SADLER BROS., Noorat. (Ayrshire).

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lenore of Ecclefechan	2,692	20.3.14	27.3.14	273	12½	5,721½	4.11	235·46	175	267½
Gladys of Ecclefechan	Not yet allotted	26.3.14	2.4.14	273	4	7,473	3.91	292·31	250	333¼

W. WOODMASON, Malvern. (Jersey).

Completed since last report, 9. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Laura VIII. of Melrose	Not yet allotted	31.12.13	7.1.14	273	19½	4,734¾	5·50	260·42	175	296¾
Zoe V. of Melrose ..	1,496	8.1.14	15.1.14	273	19	5,284½	6·94	366·60	250	418
Rarity V. ..	Not yet allotted	23.1.14	30.1.14	273	21	7,200¾	5·77	415·51	250	473¾
Mystery VIII. of Melrose	Not yet allotted	24.1.14	31.1.14	273	18½	5,556	6·32	351·02	[illegible]	400¼
Laura of Melrose VI.	Not yet allotted	20.2.14	27.2.14	273	20	*7,667½	5·68	435·78	250	496¾
Jenny Lind of Melrose VI.	Not yet allotted	4.3.14	11.3.14	*268	17½	7,081½	5·03	356·39	250	406¼
Jessie of Melrose XIV.	Not yet allotted	16.3.14	23.3.14	273	13	4,141½	5·51	228·34	175	260¼
Lady Melrose 4th ..	Not yet allotted	16.3.14	23.3.14	273	18	5,152¼	5·22	269·22	175	307

* Lost first five days through omission to weigh.

F. J. STANSMORE, Pomborneit. (Ayrshire).

Completed since last report, 29. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Ida of Yalart ..	2,717	5.1.14	12.1.14	273	17	5,937¾	4·97	295·20	250	336½

PRICKLY PEAR FOR DAIRY COWS.

The prickly pear is denounced as Australia's greatest pest in your *issue of 2nd April, page 767. If the species found there is anything* like the American prickly pear, perhaps the result of a test by the Dairy Division of the Bureau of Animal Industry may be of interest.

Prickly pear is very palatable to dairy cows, and when fed in amounts varying from 60 to 100 lbs. a day makes the cow very thrifty and productive. Larger amounts are too laxative in effect. The pear is low in protein and high in mineral matter. It contains from 87 to 93 per cent. of water, and hence is a capital supplement for cotton seed and its products. Compared for milk-making with other southern roughages, 1 lb. of sorghum hay equals 10.1 lbs. of pear, 1 lb. of sorghum silage equals 3.3 lbs. of pear, and 1 lb. of cotton seed hulls equals 8.8 lbs. of pear. By substituting 60 to 75 lbs. of pear for a portion of dry roughage, the per cent. of fat in the milk dropped .42 per cent. on the average, but the milk *flow increased.*

Two dry cows were maintained for fifty and sixty days respectively on 113 and 105 lbs. of pear and 2 lbs. of cotton seed meal daily. One cow fed pear alone lost 30 lbs. in weight in seventy days. Another cow died from stoppage of the intestine by fibre balls from the pear when it was the sole ration. Pear-fed cows were more sensitive to the cold, and lost about 7.5 per cent. in milk flow when fed a heavy pear ration, as compared to 1.91 per cent. for cows on a dry ration. Cows fed pear drank less water, those receiving no roughage except pear going for days at a time without drinking. This shows pear to be a valuable feed when there is a scarcity of water.

One man can singe a ton of pear in fifty minutes with a gasoline torch, using 1⅔ gallons of gasoline. The pear is singed on the stalk, and may then be pastured, which is wasteful, or cut and fed. The spineless pear is about the same in composition, may be harvested more cheaply, but yields less product. It costs about 6 dol. to 7 dol. per acre to establish a field. Shallow cultivation for weeds and grass is necessary. The second year's yield in Texas was 85 tons per acre, while the yield from old stumps runs above 100 tons per acre.

Department of Agriculture, E. W. Morse.
Queensland.

—*Breeders' Gazette*, 25th June, 1914.

IRRIGATED LUCERNE AT CENTRAL RESEARCH FARM, WERRIBEE.

Preliminary Results of Tests.

A. E. V. Richardson, M.A., B.Sc. (Agric.), Agricultural Superintendent.

Every cultivated plant, be it cereal, forage, legume, or fruit, has somewhere its enthusiasts and devotees, who are ever ready to extol the merits and value of their favourite crop. Lucerne is no exception to the rule, and enthusiastic growers of this legume have variously dubbed it "The king of fodders," "The greatest mortgage-lifter yet discovered," "The best soil renovator known to agriculture."

Whilst such praises may seem extravagant to the lay mind, yet it must be admitted that, given suitable soil conditions, lucerne is one of the most prolific and nutritive forages that can be grown on the farm.

Certainly it must receive large quantities of moisture during the growing period to reach perfection, consequently full and profitable growth may only be looked for either where (1) the summer rains are abundant, (2) irrigation is practised, or (3) where supplies of underground water are available at reasonable depth.

This, perhaps, might be expected, for no plant can accumulate large quantities of nutritive matter in its stem and leaves without transpiring considerable quantities of water, and the tests so far carried out at Werribee seem to show that successful lucerne growing depends more on keeping the soil and subsoil at a proper degree of moisture saturation by judicious irrigation than on fertilizing, inoculating, liming, cultivating, or manuring the soil.

This will be apparent when the preliminary results of the lucerne tests at the Central Research Farm, Werribee, are considered. The various results obtained, however, are not by any means to be considered final. Tests with a perennial forage like lucerne must be carried out for a number of years in succession on systematic lines before deductions of value may be drawn. It is intended to briefly describe the experiments in progress, and to indicate some of the more important results obtained.

I. Preparation of the Land.

Preparation of the Land for Lucerne.

Before discussing details of the various trials, a short account of the mode of treatment of the land and the crop will be an advantage.

The 50-acre block on which the tests were carried out is similar in character to the average irrigation land on the Werribee Estate. The soil is a reddish clay loam, varying in depth from 7 inches to 9 inches, and resting on a more or less impermeable, stiff, red clay subsoil. The Werribee soils closely resemble the red clay loams of the Goulburn Valley, both in chemical composition and mechanical texture, except that they appear slightly deeper and rather more permeable to water. Compared, however, with the friable, free-working, well-drained loams of some of the northern settlements, *e.g.*, Cohuna and Merbein, the permeability of the Werribee land leaves much to be desired. Moreover, a portion of the land is quite as tenacious and sets as hard as the inferior class of Goulburn Valley land.

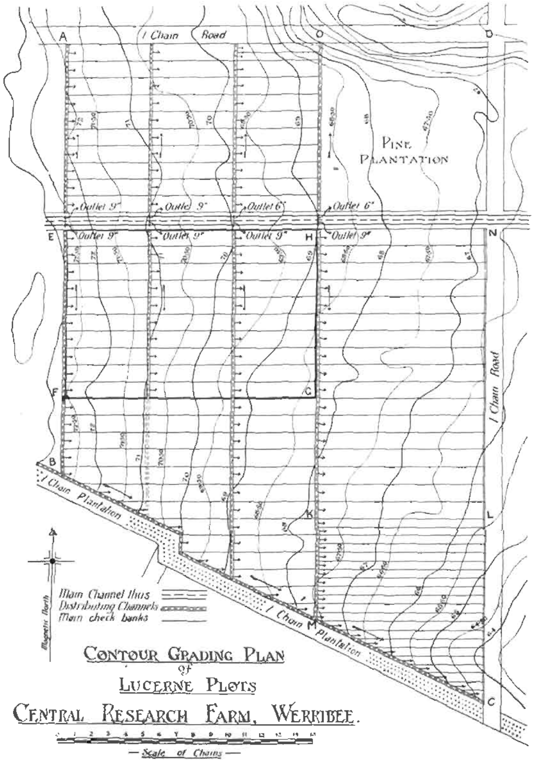

1 Chain Road
Pine Plantation
Outlet 9"
Outlet 6"
1 Chain Road
1 Chain Plantation
Main Channel thus
Distributing Channels
Main check banks
Magnetic North
CONTOUR GRADING PLAN of LUCERNE PLOTS
CENTRAL RESEARCH FARM, WERRIBEE.
Scale of Chains

Fig. 1.

Subsoiling.

It was felt, therefore, that good growth of lucerne could only on such soil result from some form of cultivation which opened up the subsoil and permitted free development of the root system of the lucerne.

Consequently, the whole of the area was cultivated to a depth of 12 inches to 14 inches by means of suitable subsoilers. For this purpose a specially constructed subsoil plough was used. This consisted of a double-furrow Mitchell plough, in which the front mould-board was replaced by two strong curved steel tines working 6 inches to 8 inches below the level of the remaining mould-board, which turned over the sod to a depth of 6 inches to 8 inches, according to the depth of soil available. The curved tines opened up the soil to a depth of 12 inches to 14 inches, *i.e.*, the subsoil was deep-stirred to a depth of 6 inches to 8 inches below the furrow slice without bringing any of the raw, crude subsoil to the top.

As the fall of the land was such as to necessitate a system of checks and cross checks at a distance of 1 chain apart, the subsoiling was done in 1-chain lands at right angles to the line of fall, and the crowns of the lands were subsequently utilized for the "cross checks" in the grading operations. Each subsoiler averaged about 1 acre per day, and required

Fig. 2.—Subsoiling for Lucerne, Central Research Farm, Werribee.

six horses. The subsoiling tines required re-shaping daily, owing to the severe wear and tear with the stiff subsoil. The cost of the subsoiling was about 27s. 6d. to 30s. per acre.

Immediately the subsoiling was finished, attention was concentrated on getting the soil into a suitable tilth for grading operations. For this the spike roller, with harrow attached (Fig. 3), the spring-tooth cultivator, and the slicker or smoother (Fig. 5) proved extremely useful. When a suitable tilth was obtained, the land was ready for grading operations.

Method of Grading.

Thorough grading is the foundation of successful lucerne growing. Unless the land is properly graded, unequal distribution of water and patchy crops result. There can be little doubt that in our irrigation districts the growth of lucerne is dependent on the extent to which the water can be effectively controlled during the process of irrigating the crop. If the grading is done in such a way as to allow the water to flow evenly and regularly over the crop, heavy cuts of lucerne may be expected.

Main Check Banks.—The effectiveness of grading depends largely on the nature and amount of fall in the land. In most of the northern irrigation settlements the land is so level that very little grading is necessary. In other cases the surface is so uneven as to necessitate levelling and "checking."

Where the fall of the land is in one direction only the grading operations are relatively simple. The irrigation ditch runs along the highest contour of the field, and the main check banks at right angles to the contour lines (*vide* Grading contour plan, Fig. 1). If the fall is very gradual the "border" system of irrigation may be practised. In this case check banks are placed parallel to one another at intervals of 44 feet to 66 feet without any cross check banks.

If, however, the fall is considerable, as was the case at Werribee, the introduction of cross checks is necessary, in order to secure regular, uniform and controlled watering (Fig. 7).

In the case we are discussing, a contour plan of the 50 acres was obtained prior to subsoiling operations with an ordinary level and survey staff. This showed that the fall varied from 2½ inches per chain to 6

Fig. 3.—Working for Tilth Preparatory to Grading Operations.

inches per chain (*vide* Fig. 1). The contour plan provides the irrigator with the necessary data for determining the direction in which the distributing channels and check banks should be laid out. It will be noticed that the distributary ditches run practically parallel with the contour lines.

The check banks (indicated by faint lines) were for the most part placed 1 chain apart. On the area KMCL, however, the "side fall" was considerable, and in order to avoid shifting too much soil on grading operations on this area, and thus exposing some of the raw crude subsoil, the main check banks were placed 33 feet apart. Reference to this contour plan will show that the fall averages 4 inches per chain.

Cross Checks.—The best fall for successful irrigation by flooding on land of ordinary permeability is about 1 inch to 100 running feet (1 inch to 1½ chains). As the fall on this particular area considerably exceeded this, it was deemed necessary to use "cross checks" at intervals of 1 chain placed at right angles to the main check banks. Where the fall was

excessive (KMCL, Fig. 1), the cross checks, as well as the main checks, were set out at intervals of ½ chain. Without this system of cross-checking it would not be possible to hold the water back and give each bay that thorough and uniform soaking which experience dictates to be necessary for the successful growth of lucerne. When finished, the paddock appears to be divided up like a chess-board, with bays 1 square chain in area. (Fig. 6).

That such a method of grading is successful in achieving its object—the even and uniform distribution of irrigation water—may be seen from Fig. 7. Note how the cross checks act in damming back the water on each "bay" until the whole area within the bay is thoroughly and uniformly soaked.

Putting up Check Banks.—A brief description may now be given of the method of putting up the check banks.

After the soil has been fined down with spike roller, harrow, cultivator, and "slicker," crowns are thrown up 1 chain apart, with a single-furrow plough, at right angles to the direction of subsoiling and at right angles to the fall of the land. In the early stages

Fig 4.—Grading Operations. Throwing up Main Check Banks with Check Banker.

of the work a specially constructed check-banker was used. (Fig. 4). This implement consisted of two pieces of 12-in. by 2-in. oregon, shod on the inner face with steel and placed obliquely to one another, and fitted in the shape of a V, 8 feet across the front end and 2½ feet at the back. The two pieces of oregon were connected by iron bands. It was drawn by eight horses, and gathered up the soil for 4 feet on either side of the crown made by the plough, and forced it through the back part of the check-banker (*vide* Fig. 4). This implement would put up 10 to 12 miles of check banks a day. Latterly, however, it has been discarded, because experience has shown that the "slicker," by working on a good strong crown thrown up by a single or double furrow plough, could make an ideal check bank, with a minimum expenditure of labour and horseflesh, and, at the same time, effectively grade the land.

Indeed, the "slicker" (Fig. 5) has proved to be one of the most useful implements in grading the land and producing a fine tilth. The "slicker" consists of three pieces of 12-in. x 2-in. oregon, 12 feet long, connected by two pieces of 6-in. x 6-in. hardwood, and drawn by four

horses. The oregon is shod with 2-in. x ¼-in. steel on the front faces. Two of the pieces are inclined at an angle of about 60 degrees to the horizontal, while the third piece is vertical and acts as a fulcrum. The operator, by moving forwards or backwards while the implement is moving, can gradually "collect" or "pay out" the soil at will, and so remove inequalities of the surface. By careful manipulation the "slicker" will ride over the check banks, and build them up as firmly and regularly as can be done with a buckscraper. (*Vide* Fig. 5).

The implement may be constructed by a handy man at a cost of £2 or £3. At the points of intersection of the checks and cross checks small openings will be left in the banks. These need to be filled in with a shovel.

As lucerne, under favorable conditions, is likely to occupy the land for a decade or more, special care and attention should be given to the preliminary work of grading and seeding.

To secure a good "stand" of lucerne, the preliminary operations should leave the seed bed firm, finely divided, and moist, and the seed

Fig. 5.—Smoothing the Check Banks with Slickers.

SEEDING AND INOCULATION.

should be sown shallow on warm, moist soil. No effort should be spared in securing a thoroughly fined and compact seed bed. The spike roller harrows, springtooth cultivator, and slicker, used in rapid succession, will assist materially in securing this condition of the seed bed.

Time to Sow.—The best time to sow lucerne varies with the district. At Werribee lucerne has given good results sown either in autumn or in the spring. On the whole, however, spring sowing appears to be more favorable when lucerne is sown on irrigated land.

It must be remembered that lucerne is rather delicate in the early stages of growth, and makes relatively slow progress the first season. At this stage it is very susceptible to competition with weeds. But as soon as its roots penetrate the subsoil it will crowd out all competitors, exterminate weeds, *e.g.*, hoary cress (*Lepidium draba*), which prove very troublesome under ordinary cultural conditions.

If sown in the autumn, frosts may play havoc with it, and if the seed bed is not thoroughly clean, the "stand" may suffer from competition with cape weed, sorrel, which grow faster in winter-time than does young lucerne. Under these circumstances, better results would be obtained by

keeping the weeds in subjection by cultivating the soil during winter and sowing the lucerne in the spring. With spring sowing on irrigated land, the lucerne comes away nicely and has a better chance of getting ahead of the weeds.

The latter end of August and early September appears to give best results in districts similar to Werribee, though in certain cases sowing as late as October and November have given very favorable results, where moisture conditions of the soil are favorable to rapid germination.

Quantity of Seed per Acre.—So far as the quantity of seed required per acre is concerned, much depends on (1) the vitality of the seed, *e.g.*, its germinating capacity, (2) the cleanliness and fineness of the seed bed, (3) depth and manner in which the seed is sown, and (4) whether the seed bed is moist enough.

If the lucerne seed is sown deep a large proportion usually fails to germinate, and more seed is required than if sown shallow. Again, if the seed bed is cloddy and not well fined and firmed, more seed will be required to give an ideal stand.

Fig. 6.—Grading Operations completed, showing Arrangement of Main and Subsidiary Check Banks.

At Werribee, tests were made with Hunter River lucerne seed with seedings ranging from 6 lbs. to 21 lbs. per acre. From these tests it appears that the best seeding lies between 12 lbs. to 18 lbs. per acre, though smaller seedings have given perfectly satisfactory "stands." In our practice we have adopted 16 lbs. per acre as a suitable seed allowance, and drill one-half—8 lbs.—one way and 8 lbs. at right angles.

The seed may be sown with an ordinary grain drill by mixing the requisite quantity of seed with the fertilizer (say, superphosphate), and sowing the mixture through the manure box at the rate of 16 lbs. of seed and 1½ cwt. superphosphate per acre. The spouts should be taken off, and the seed and manure allowed to drop from the drill on to the ground. This insures that the seed is sown shallow. Care should be taken to mix the manure and seed immediately before sowing, as superphosphate tends to interfere with the germination of certain small seeds (particularly rape) if mixed too long before sowing.

The seed should then be brushed in either with brush harrows or a light roller or harrows.

Inoculating the Soil.—The question of inoculating the soil may be mentioned here. As is well known, lucerne belongs to a family of plants (*leguminoseæ*) which have the power of obtaining the bulk of the nitrogen they require from the air. Other plants can only secure the nitrogen essential for their growth from the soil. If the roots of lucerne, beans, clover, or any member of the pea family or plants be pulled up and examined, the presence of curious wart-like nodules will be seen growing on the roots of healthy plants. These nodules were shown by Hellriegel to be the homes of millions of bacteria, and the nodules are really factories where these bacteria store up the nitrogen of the air for the use of the plant, receiving in exchange sugary and carbonaceous materials from the plant.

This is the reason for the wonderful renovating effect of the leguminous plants on the soil. Lucerne has this renovating effect. It fixes in its roots and subsequently adds to the soil the expensive nitrogen obtained from the inexhaustible stores in the air by means of the bacteria living symbiotically on its roots. Now, if lucerne is sown on soil devoid of the particular bacteria which cause the formation of these nodules, then its growth may prove unsatisfactory and unhealthy. In some soils these bacteria are wanting. Consequently, if they are not introduced the growth of lucerne will not be healthy and vigorous. Generally speaking, if lucerne does not possess a deep green colour, and if on examination the roots do not reveal the presence of nodules, the absence of these bacteria may be suspected. We need not here enter into a discussion as to the merits of the many methods of inoculating the soil with the requisite bacteria. It will suffice to say that the most practical method is to secure some soil from an old lucerne field, in which the lucerne has developed nodules freely. In the case of the soil at Werribee, the inoculation was carried out by securing soil mixed with lucerne roots from old lucerne fields at Bacchus Marsh, and mixing this soil with the seed and fertilizer at the rate of 2 cwt. of inoculated soil per acre.

It appears from the results at Werribee that it is not necessary to inoculate the *whole field*. If one portion is thoroughly inoculated, the remainder soon becomes inoculated from the irrigation water flowing over the field, by the carrying of soil from one place to another with implements, stock, and persons.

The difference between the inoculated and non-inoculated plots at Werribee was very marked two years ago. These differences have since almost completely disappeared, owing most probably to the irrigation water conveying the requisite bacteria from the original inoculated portions to the non-inoculated parts, and thus bringing about the inoculation of the whole area.

Variety of Seed to Sow.—In view of the permanent character of the lucerne crop, the question of variety of seed to sow is far more important to the lucerne-grower than is the choice of variety to the wheat-grower.

Curiously enough, the varieties of lucerne seed sold on the Melbourne market are for the most part named after the country in which they originated. Thus we have Peruvian, Patagonian, French Provence, Arabian, Spanish, Turkestan varieties figuring prominently in seedsmen's catalogues.

The Hunter River and Tamworth varieties are supposed to be acclimatized forms of Provence seed. The best all-round variety is undoubtedly Hunter River or Tamworth lucerne. It has given consistently heavy yields throughout the whole of the tests. Peruvian and

Arabian are noteworthy as good winter growers, and Patagonian—a recently introduced type—is likely to prove a useful variety. Turkestan has not done well at Werribee, though it appears to do very well at the Sparrovale Farm, Geelong.

There is certainly a wide and useful field of work in selecting and breeding good strains of lucerne from the complex medley of types that can be isolated in any of the so-called "varieties."

Fertilizers.

The use of superphosphate in small dressings has become so universal a practice with wheat and cereal growers in this State that one might be inclined to argue that small applications of phosphate would equally serve the lucerne crop.

Liming the Crop.—But there are several points of difference between the requirements of lucerne and the requirements of wheat. Lucerne being a leguminous plant, and able to obtain what nitrogen it requires from the air, does not need to be supplied with this most expensive plant food. *But it can only obtain these supplies provided the soil is in such* a condition as to favour the free development of those bacteria on its

Fig. 7.—Irrigation, showing how Cross Check Banks assist in obtaining an even Distribution of Water.

roots which were shown to be the cause of nitrogen fixation. Consequently it is of the utmost importance to see that the soil conditions are most favorable for this process of nitrogen fixation. For this reason lucerne will only thrive to perfection in soils that are neutral or slightly alkaline in reaction. If the soil is sour or acid in character, as is evidenced by the free growth of sorrel, dock, plaintain, &c., an application of lime is essential to bring the soil into good condition. Soils that have been cropped with superphosphate for long periods, badly-drained soils, and virgin lands rich in organic matter are most likely to be acid in character, and requiring a dose of lime as a corrective. Lucerne, as indeed all leguminoseæ, are lime-loving plants, and thrive best in soils containing naturally a high percentage of this ingredient.

We need not stop to consider the many benefits of liming lands. These were fully discussed in Bulletin No. 19, published by this Department, copies of which will be forwarded to any interested. It will merely suffice to say that the lime assists in liberating plant food especially potash and phosphates, improves the physical and mechanical condition of the soil and provides a suitable base for the beneficial operations of the soil bacteria.

With the exception of the black soils of the Wimmera, and the limestone soils of the Mallee, there are very few Victorian soils that would not favorably respond to the application of lime in lucerne growing under irrigation.

The bulk field at Werribee have been treated with 1 ton of lime (ground lime containing about 92 per cent. of CaO) per acre at the completion of grading and prior to seeding. This lime was sown with a Jack Lime Distributor and lightly harrowed in. Plots have been laid out to test the effect of ground shell, gypsum, ground limestone, burnt and slacked lime in varying quantities applied as top-dressing to established lucerne crops, but as the top-dressings were only applied in July, 1914, insufficient time has elapsed for recording any results.

So far as potassic manures are concerned, lucerne, as is well known, responds markedly to these, but it appears to be sounder practice to liberate the necessary potash from the soil by adding lime and gypsum rather than to apply them in the expensive form of sulphate and muriate of potash, especially in view of the comparative richness of our Victorian soils in potash.

Nitrogenous Manures, as explained above, should be unnecessary, since lucerne has the power provided the soil conditions are favorable to obtain the nitrogen required from the air.

Phosphatic Manures are essential to lucerne growing, in view of the large quantity of phosphates removed by the crop, and the admitted poverty of the average Australian soils in phosphates.

The lucerne-grower is advised to be more generous in his allowance of artificial fertilizer than is the wheat-grower. The latter is limited to small dressings on account of comparatively small rainfall. The lucerne-grower, however, who is depending on irrigation can use with profit far heavier dressings of artificials than can be profitably used under dry farming conditions. Consequently, a substantial dressing of superphosphate at seeding time, and a regular top-dressing of phosphates every winter or every alternate winter is advisable in lucerne growing under irrigation. The wheat-grower is compelled to use water soluble phosphates, in view of the scanty rainfall. The lucerne-grower, with irrigation, may find basic slag, bonedust, phosphatic guanos of advantage as top-dressings. Superphosphate should be chosen to sow with the seed, however, as under our conditions it gives the young plants a vigorous start, and forces the growth for the first year. Of all the manures that can be used for lucerne there is none that will give such results as heavy top-dressings of stable manure. The stable manure is not only a general manure—supplying the lucerne with every plant food required—but its mechanical action on the soil in keeping it open, allowing free access of air to the roots, its biological action in stimulating the soil bacteria, as well as its mulching effect makes it superior to all other fertilizers.

II. Results of Tests.

1. *Bulk Lucerne Tests.*—The first block of 15 acres was sown at Werribee on 25th September, 1912. The germination was satisfactory, and the young plants made good progress. On 6th to 9th November—six weeks after seeding—the first irrigation was given. A spell of hot weather, and the comparative absence of subsoil moisture, owing to a dry winter, were responsible for the application of the water so early in the season.

Three cuttings were obtained during the first season:—(1) 6th January, 1913; (2) 26th March, 1913; and (3) 5th May, 1913. During the season water was applied three times:—(1) 6th to 9th November, 1912; (2) 15th to 17th January, 1913; (3) 8th to 10th April, 1913. As the weighbridge had not been installed as yet, no data was obtained regarding the weight of hay from these cuts. In July 850 ewes and lambs were grazed on the 15 acres for eight days, and the field was then cultivated both ways with a spiked disc lucerne renovator.

During the second season the cuttings were weighed load by load over the weighbridge. In order to secure exact data samples of the hay were taken from each load, and the amount of moisture determined. The results were then reduced to a uniform basis of commercial hay possessing 15 per cent. of moisture and 85 per cent. of dry matter.

Table I. gives a summarized statement of the weight of hay obtained.

Fig. 8.—Sowing the Inoculated Seed and Fertiliser.

Table I.

Summary of Weight of Lucerne Hay cut from Bulk Field, Season 1913-14.

No. of Cutting.	Date of Cutting.	Acreage Cut.	Total Yield of Hay.				Yield of Commercial Hay per acre.
			tons	cwt.	qrs.	lbs.	cwt.
First ..	30th Sept., 1913	15·00	12	0	0	0	**16**
Second ..	15th Nov., 1913	15·00	16	1	1	0	**21½**
Third ..	29th Dec., 1913	13·33	16	14	0	16	**25½**
Fourth ..	4th Feb., 1914	13·35	16	15	0	16	**26¼**
Fifth ..	10th Mar., 1914	12·02	15	10	0	18	**23¾**
Sixth ..	29th Apr., 1914	14·77	11	4	0	5	**15**

Total per acre for Six Cuts .. .. **6 tons 9¾ cwt.**

The above figures are calculated on a basis of commercial hay containing 85 per cent. of dry matter. A variable portion of the 15 acres was used subsequently to 1st December, 1913, for green feed for cows. This was not included in the weights and calculations given above.

During the present season (1914-15) three cuts have been obtained up to the present (7th January). The second year's results promised early in the season to eclipse those of the first year, as the plants had thickened up during the winter, and the general growth was eminently satisfactory. This applied especially to the new lucerne sown in September, 1913. Thus the first cut from an area of 26 acres of young lucerne gave 32 tons 5¼ cwt. of commercial hay, weighed over the bridge, a yield of 24½ cwt. per acre. Again, the older lucerne, sown in September, 1912, yielded, 20¼ cwt. for the first cut, as against a yield of 16 cwt. for the corresponding cut the previous year. These expectations, however, were short lived. Owing to the shortage of water in the Pyke's Creek reservoir no water was available for irrigation purposes at Werribee after 26th September, 1914, till the end of the year, when

Fig. 9.—View of Lucerne Field, showing Lucerne ready for Cutting.

an opportune fall of rain on December 28th put sufficient water in the Werribee River to supply our requirements. Had water been available during this dry period of over three months, it is safe to say that the figures for the previous season would easily have been eclipsed, and between 7 and 8 tons of hay per acre realized for the season.

As it was, the yield for the first three cuts of old lucerne (15 acres) was—

First cut, 9th to 12th October, 1914, 20¼ cwt. per acre.
Second cut, 5th to 7th December, 1914, 16½ cwt. per acre.
Third cut, 4th January, 1915, 22¾ cwt. per acre.

It is probable that three more cuts will be obtained before the end of the season.

2. *Variety Lucerne Tests.*—Portion of the area of 15 acres sown in September, 1912, was devoted to variety trials to determine their value for hay production. As with the bulk field, six cuttings were obtained, but, unfortunately, owing to lack of facilities and pressure of work the weights of the first two cuts were not taken. The remaining four cuts were, however, weighed, and they afford a fairly reliable indication of the value of the different varieties under conditions similar to those that obtain at Werribee. The results are given in Table II.

TABLE II.

SHOWING WEIGHT OF LUCERNE HAY OBTAINED FROM VARIETY LUCERNE PLOTS, WERRIBEE, 1913-14.

Variety.	1st Cut.	2nd Cut.	3rd Cut.	4th Cut.	5th Cut.	6th Cut.	Average Cut for Season 1913.
	Weights not taken.	Weights not taken.	cwt.	cwt.	cwt.	cwt.	cwt.
Arabian			16¾	29½	24¼	8¾	**19¾**
French Provence ..			16¾	25¾	24¼	9½	**19**
Turkestan ..			11¾	16½	17	1¼	**11½**
Peruvian ..			13¾	23	19¼	8	**16**
Hungarian ..			16¾	22¾	20¾	8	**17**
Spanish			12	18	21½	8	**14¾**
Tamworth ..			25½	26¾	25¼	18	**24**

Six cuts were obtained from each variety, but the average weight per cut varied very considerably. Tamworth seed gave by far the heaviest cutting, followed by Arabian and French Provence, while the results from Turkestan seed were the least satisfactory of all.

3. *Rate Seeding and Fertilizing Trials.*—These formed part of an area of 35 acres sown with Tamworth lucerne in 1913. More time was available for the preparatory work than was the case of the area sown in 1912, and consequently the results, as judged by weight of crop produced, are rather better.

The paddock (35 acres) was seeded on 5th to 8th September, 1913, and during the first season yielded three cuts, which were utilized with other green forage for silage purposes.

During the present season three cuts have been obtained. Early in the season this lucerne field promised to give most prolific returns, but owing to the failure of the Pyke's Creek scheme no irrigation water was applied from 24th September to 29th December—a period of over three months. The first cut was exceptionally heavy, being over 50 per cent. heavier than the corresponding cut for last season, but owing to the failure of the water supply, due to the droughty season, the second and third cuts, which were grown without irrigation, showed, as might have been anticipated, a considerable falling off.

Table III. summarizes the results

TABLE III.

PRELIMINARY RESULTS, WERRIBEE LUCERNE TRIALS, 1914-15.

Comprising Rate Seeding, Lime and Fertilizer Trials, and Inoculation Tests.

Details of Plot.	Oct. 9th. 1st Cut.	Nov. 30th. 2nd Cut.	Jan. 5th 3rd Cut.	Total Cut for First Half of Season.
	cwt. *	cwt. †	cwt. †	cwt.
(1) RATE OF SEEDING TRIALS—				
Plot 1. Tamworth lucerne, 6 lbs. per acre	32·3	18·4	26·3	**77·0**
,, 2. Tamworth lucerne, 9 lbs. per acre	28·3	17·7	21·8	**67·8**
,, 3. Tamworth lucerne, 12 lbs. per acre	34	17·5	28·3	**79·8**
,, 4. Tamworth lucerne, 15 lbs. per acre	33·3	17·7	26·4	**77·4**
,, 5. Tamworth lucerne, 18 lbs. per acre	34·5	17·4	25·3	**77·2**
,, 6. Tamworth lucerne, 21 lbs. per acre	33·4	18·9	24·5	**76·8**
(2) FERTILIZER TRIALS—				
Plot 1. Lime, 20 cwt., super. 2 cwt., blood manure 1 cwt	35·4	19·3	30·5	**85·2**
,, 2. Lime, 40 cwt., super. 2 cwt. ..	28·3	16·0	30·7	**75·0**
,, 3. Lime, 20 cwt., stable manure, 10 tons per acre	34·6	21·3	27·1	**83·0**
,, 4. Lime, 20 cwt., super. 2 cwt., nitrate of soda, 1 cwt.	37·5	15·4	35·6	**88·5**
,, 5. Lime, 20 cwt., super. 2 cwt., sulphate of potash, 1 cwt. ..	32·9	18·1	28·0	**79·0**
,, 6. Lime, 20 cwt.	35·3	15·3	26·2	**76·8**
,, 7. Lime, 20 cwt., bonedust, 2 cwt. ..	31·7	18·8	27·2	**76·7**
,, 8. Lime, 20 cwt., Thomas phosphate, 2 cwt.	34·2	15·2	27·5	**76·9**
,, 9. Lime, 20 cwt., superphosphates 2 cwt.	33·0	17·3	27·0	**77·3**
,, 10. Ground limestone, 36 cwt. ..	32·1	12·2	26·3	**70·6**
,, 11. Nil	27·4	15·1	25·9	**68·4**
,, 12. Superphosphates 2 cwt. ..	33·0	17·3	29·5	**79·8**
(3) INOCULATION AND LIMING TESTS—				
Plot 1. Not limed, not inoculated ..	33·1	10·9	26·9	**70·9**
,, 2. Not limed, inoculated with 1 ton lucerne soil	30·3	13·5	26·1	**69·9**
,, 3. Not limed, inoculated with 2 cwt. lucerne soil	28·5	15·1	26·2	**69·8**
,, 4. Limed, not inoculated	29·1	10·5	26·4	**66·0**
,, 5. Limed, inoculated with 1 ton lucerne soil	30·0	13·7	26·0	**69·7**
,, 6. Limed, inoculated with 2 cwt. lucerne soil	31·7	13·7	26·1	**71·5**

All returns given in terms of commercial hay containing 85 per cent. *dry matter.*
Rainfall, Sept. 1914, 1·32 in.; Oct. 0·12 in.; Nov. 1·65 in.; Dec. 3·04 in.
* *Irrigated.* † 2nd and 3rd cuts grown without irrigation.

COMMENT ON PRELIMINARY TESTS.

In carrying out the weighing and sampling of hay from these plots, the greatest care has been taken to obtain data for a uniform basis of comparison.

Every load of hay brought to the weighbridge was carefully sampled, and the samples immediately forwarded in hermetically sealed recep-

tacles to the Agricultural Laboratory for the determination of the dry matter. The figures given in the tables represent the weight of hay reduced to the basis of commercial lucerne hay containing 85 per cent. of dry matter.

It is far too early to draw deductions from the results of the various plots, and the possible bearing of the results on practice. It will be time enough to draw such generalisations when more data has been accumulated. Meanwhile, there are features of interest in these tests that are worth pointing out, if only to see whether later experience will confirm or modify what now seems reasonably true.

1. *Regarding the Prolificacy of Irrigated Lucerne at Werribee.*—No one would claim that the land on which this lucerne was grown was by any means ideal lucerne soil. Nor could it be said that the land is much better than the average irrigation land on the Werribee Estate. Yet the return from a 15-acre block averaged 6½ tons of commercial hay in the second year of growth, besides providing considerable winter grazing for sheep. The yield for the third season promises to at least equal that of the second year, in spite of the fact that no water was received for irrigation purposes from 24th September to 28th December, 1914—a period of over three months. Had the water been available during this period, it is reasonable to expect that the yield for the third season would have considerably exceeded that of the second. Again, the average yields from the experimental plots (sown September, 1913) have for the present season exceeded 3¾ tons per acre, though probably three cuttings still remain to be garnered, and in spite of the fact that these plots did not receive any water for over three months.

From this it is apparent that irrigated lucerne sown under conditions similar to those at Werribee promises to be a most prolific and profitable crop, and the completion of the Exford weir should enable the Werribee Irrigation Estate to become a highly prosperous settlement.

2. *Effect of Soil Inoculation.*—With regard to the inoculation tests, a comparison of the six plots will reveal that during the second season of growth there is very little difference between the inoculated and the corresponding non-inoculated plots. The first year, however, the differences were very marked. One of the most striking ocular demonstrations at Werribee during the summer of 1912 was the difference in the appearance of four 2½-acre blocks of lucerne, two of which were inoculated with lucerne soil from Bacchus Marsh, and two of which were not inoculated. As Autumn and Winter approached, the differences became less marked, and in the second season they had disappeared altogether. So with these smaller plots; at first the inoculated plots were a rich healthy green, and examination of the young roots showed that nodules were forming freely. The non-inoculated plots showed in the early stages a pale yellowish unthrifty appearance, but as the season wore on the difference between the plots gradually disappeared. It can only be surmised that the non-inoculated plots became slowly inoculated through the medium of the irrigation water as it flowed from plot to plot and from field to field, and this is borne out by the appearance of nodules on the non-inoculated plots in late Autumn following the seeding.

The point to note, therefore, is that inoculation should not be necessary in a district where successful lucerne growing under irrigation has been carried on for a time, and that, in cases where lucerne has never

been sown on a farm or in a district before, an effective inoculation of a relatively small area should soon lead to the inoculation of the whole area, by the carrying of the bacteria by air, dust, irrigation water, stock, and farm implements.

3. *The Effect of Various Fertilisers.*—The results of the fertiliser tests are of interest. It will be noted that by far the highest crops were obtained by using nitrogenous manures. In view of what has been said already regarding the ability of lucerne to obtain its nitrogen from the air, this may perhaps seem strange. But the explanation is simple enough. To secure the necessary nitrogen from the air, energy must be expended by the bacteria living on the lucerne roots, and by the lucerne in providing food for the bacteria. If you supply the nitrogen in the form of manure, or provide an excess of it in the soil, then the lucerne will prefer to use what is so supplied, instead of extracting it with the expenditure of more or less energy from the air.

Fig. 10.—Harvesting a 50 Acre Block of Lucerne at Central Research Farm, Werribee.

Generally, it is not considered good farming practice to apply nitrogenous manures to a leguminous crop like lucerne. It is considered proper that the lucerne should be forced to obtain its nitrogen from the inexhaustible supplies in the air. But, if the farmer can secure a handsome profit by applying a nitrogenous manure to a legume is not he justified in doing so? Examination of the results of the fertiliser trials will show that the plots dressed with nitrate of soda, blood manure and farmyard manure have yielded considerably in advance of the remaining manures.

If these plots continue to stand out as prominently in the next three cuts as they have in the first three, the question of applying nitrogenous manures may become of immediate practical importance.

Effect of Phosphatic Manures.—It appears from the results of these preliminary tests that superphosphate is the most effective of the phosphatic manures in the early stages of the lucerne. It has given the best

results where it has been applied by itself. When applied with lime the crop yields appear to have been depressed. Thus—

Plot 11.—No manure	68.4 cwt.
Plot 12.—Super. 2 cwt.	79.8 cwt.
Plot 9.—Super. 2 cwt. x 20 cwt. lime ...	77.3 cwt.
Plot 2.—Super. 2 cwt. x 40 cwt. lime ...	75.0 cwt.

Probably the addition of lime has led to the reversion of the water soluble phosphates of the super. to insoluble forms and thus rendered its phosphates temporarily ineffective.

Lime.—So far as the action of lime is concerned, it appears that it has most immediate effect when applied as slaked lime. Thus, 20 cwt. of lime applied in the form of slaked lime has given a far better crop than 36 cwt. of ground limestone containing the same quantity of lime. Thus—

Plot 11.—No manure	68.4 cwt.
Plot 10.—Ground limestone, 36 cwt. ...	70.6 cwt
Plot 6.—Lime, 20 cwt.	76.8 cwt.

This, of course, might possibly have been expected. Ground limestone acts very slowly on the soil, but its effect is nevertheless very lasting, and some time must elapse before its full effect becomes noticeable on the crop. Again, a comparison of Plots 6, 7, 8 and 9, which are practically identical in yield, would seem to show that a good dressing of lime has a considerable effect in liberating phosphates from the soil, and thus dispensing to some extent with the need for their application. This is very different, however, from our experience with wheat. With wheat, phosphates are always and absolutely necessary for successful crops, no matter how much lime is applied to the soil. But it must be remembered that the lucerne is an irrigated crop and receives on an average 24 inches of applied water in addition to the normal rainfall. Consequently the soil conditions in the case of lucerne and wheat are entirely different. The one is grown on a 16-inch rainfall, the other on what is equivalent to a 40-inch rainfall. Under these latter circumstances it would naturally be expected that lime would act more efficiently on the lucerne land than on the wheat soils.

More investigational work is necessary before a definite pronouncement on this interesting point is possible, and steps have been taken since the laying down of these plots, to further test the effects of sea-shells, ground limestone, gypsum and slaked lime, applied in different quantities with and without phosphates, on established lucerne plots.

Rate of Seeding and Variety Lucerne Trials.—The results of the rate of seeding trials emphasizes how small a seeding may give a good stand if the soil and weather conditions are favorable at the time of sowing. The six plots varying in seeding allowances from 6 to 21 lbs., were sown on a very fine seed bed, on 5th September, 1913. Several timely quarter-inch showers at intervals of a week followed by a good soaking rain kept the surface moist and enabled a good germination to take place.

Plot 1 (6 lbs. of seed) has given a very satisfactory stand, and is now almost as good as any of the heavier seedings, but the favorable character of the seeding season must be borne in mind. The plot sown with 12 lbs. per acre has so far given the best return, whilst there is little to choose between the 15 and 18 lbs. Sixteen pounds of seed per acre is the allowance we have adopted in practice, and all areas seeded with

this quantity have given excellent stands. Weather and soil conditions at time of seeding determine whether more or less than this average quantity should be sown.

So far as Variety Trials are concerned, Tamworth and Hunter River seed has given better results than the imported types. This is supposed to be an acclimatised form of French Provence seed, and it would be interesting to know how acclimatised seed of these different varieties raised at Werribee would compare with the imported seed sown under similar conditions. Judging from the experience obtained with wheat varieties, the results should be highly satisfactory, and arrangements are being made to carry out such trials at an early date.

III. Notes on Treatment of Irrigated Lucerne.

With lucerne sown in the spring on well-graded land in good tilth, the germination should, in most seasons, be satisfactory. The subsoil being well moistened by winter rains, spring showers will normally enable germination to take place evenly, and allow the young plants to strike down towards the moist subsoil. But if the soil and subsoil be not thoroughly moist at seeding it would be better either to delay the seeding or to irrigate the land, and work it down rapidly as soon as teams can be got on to the soil prior to sowing.

If water be applied during the period of germination to "bring up the seed," the "stand" will most probably be poor, especially on clay soil, owing to the caking action of the fine surface soil, and the inability of the young lucerne plant to force its way through the rapidly-drying crust. A good "stand" is essential for a heavy crop, and for ease and economy in watering.

The first irrigation of young lucerne should be delayed as long as possible on our stiff lands, in order to give the rain and conserved soil moisture the fullest opportunity for bringing on the young plants. Avoid grazing the young lucerne with stock during the first season. Once the plant gets established judicious grazing may prove beneficial, but cutting is recommended through the first summer. The first season's growth will rarely give a heavy crop, or good quality hay. It may be used for feeding stock or conversion with bulky forage into silage.

Winter Treatment.—After the last cut, the winter weeds will probably come away very fast, and make headway while the lucerne lies dormant.

During July and August, therefore, sheep may be employed to graze off the winter growth, and clean up the weeds. It is astonishing how well sheep and lambs do on this winter growth. They will clean up the weeds far better than any cultivator, and their droppings will materially help to improve the fertility of the soil.

During August the sheep are removed, and the whole area should be scarified and cross scarified with suitable lucerne renovators. Either the spiked disc, the tine cultivator or even the ordinary disc may be used for this purpose. Such cultivation will not, as some suppose, injure the stand, but the splitting of the crowns caused by judicious discing will lead to increased stooling, whilst the aeration received by the roots will stimulate fixation of nitrogen, and lead to early and

rapid spring growth. Finally the opening up of the soil will enable the spring rains to percolate more readily instead of lying about on the surface.

These rains will usually mellow down clods formed during the winter cultivation and give the mowers and rakes a good surface to work on. If, however, the surface is left too cloddy the roller may be used to advantage to avoid gathering lumps of soil with the first cut.

If it is deemed advisable to top dress or apply lime to the established crop it may be done with advantage during this comparatively dormant period of the lucerne, either prior or subsequent to cultivation. In the latter case the harrows may be used to work the fertilizer into the soil.

Winter Irrigation.—The question now arises as to whether the lucerne should be watered in the winter months. In normal seasons the winter rainfall in most districts is sufficient to saturate the soil, in which case winter irrigation would be both unnecessary and harmful.

In such a season as we have just passed through, however, winter irrigation would be decidedly advantageous. The danger in winter irrigation is, of course, the effect of the cold water on the growth of

Fig. 11.—Harvesting Lucerne on Fertiliser Plots, Werribee.

the crop. Germination and plant growth is suspended at 41 deg. F., and if the temperature of the water is much below this, it will reduce the body of the soil below the temperature at which growth is possible.

If, however, the water be above 50 deg. F. no danger to the growing crop need be apprehended. Water was applied to the whole of the lucerne, permanent grass, clover fields, and irrigated cereals at Werribee on 5th to 7th August of last year with markedly beneficial results. As is well known the capacity of water for heat is nearly five times greater than that of soil. The mean temperature of the irrigation water on 6th August was 51 deg. F., whilst that of the soil 42.7 deg. F., or 1.7 deg. F. above the temperature at which growth is suspended. In this case the water actually *raised* the temperature of the first 6 inches of soil over 6 deg. F., and resulted in a marked stimulation of the growth of all the crops.

With regard to summer irrigation, no hard and fast rules can be laid down as to frequency, time of irrigation, and quantity of water to apply. Obviously the nature of the season, the amount and distribution of the summer rain and the condition of the crop will be the determining factors. The skilful irrigator will be guided by the appearance

of his crop. Well-grown lucerne has broad, dark-emerald leaves and sappy succulent stems. Lucerne in need of water shows a peculiar characteristic dull green tinge, stunted small leaves with more or less whitish bloom, tough fibrous stems, and tends to flower prematurely and irregularly. Lucerne, more than any other crop, requires large quantities of water to keep it at its maximum development. In a set of preliminary tests at the Central Research Farm to determine the water requirements of our various farm crops, it would appear that lucerne requires at least 700 tons of water to pass through its leaves to produce 1 ton of dry hay. That is to say, 1 acre of lucerne must have at least 7 inches of water passing through the crop in order to produce 1 ton of hay. Obviously, large crops cannot be expected without heavy applications of water.

Some of our irrigated lands are debarred from producing heavy crops because of the practical difficulty of getting the soil to take sufficient water. The subsoils are so close and impermeable that water will only penetrate slowly and to comparatively shallow depths on these

Fig. 12.—Cutting of Lucerne grown without Irrigation, 1914. Top Dressing Plots in Background.

soils. During irrigation water sinks slowly to a certain depth; immediately irrigation ceases the water begins to evaporate at the surface, capillarity becomes active, and the soil begins to dry out. Such soils obviously need to be watered frequently to secure good crops, unless indeed, some steps are taken to keep the subsoils open by rational cultivation. Subsoiling the land before the sowing of the lucerne will materially assist percolation and allow of heavier applications of water. Cultivation immediately after harvesting is also recommended. Subsoiling preparatory to seeding, scarifying deeply every winter, and occasional summer cultivation will do much to improve the crop on such soils.

It was intended to test this season the comparative effect of water applied in 3-in., 4-in., 5-in., 6-in. applications at varying intervals on the growth of the crop, but the breakdown of the Pyke's Creek water supply has caused these tests to be delayed for at least a year.

A brief word may be said in regard to cutting and curing the hay.

The most suitable time to cut lucerne for hay, if weather conditions permit, is when the field is just beginning to bloom. "One-tenth in bloom" is the signal for the lucerne-grower to commence cutting. If left much later than this the stalks begin to toughen, and loss of leaf is likely to result. The young growth at the crowns of the lucerne may be taken as a good guide. When these crowns begin to put forth young shoots, it is a plain indication that the overhead growth is slackening off, and cutting should commence.

The aim of the grower should be to secure hay with the maximum of leaf and the minimum of fibre.

As soon as the lucerne is cut with the mower the hay rake or tedder should be set at work, raking it into windrows (Fig. 10). The only exception is where the lucerne is wet either with dew or rain. In this case it should be left on the ground to dry off the external moisture, and then raked into windrows as soon as possible. In this way

Fig. 13.—Weighing the Lucerne from the Experimental Plots, Werribee.

good colour and leaf are retained. The leaves are by far the richest and most nutritive part of the plant, and care should be taken to retain them in the hay. On hot dry days the processes of mowing, raking, and cocking can hardly follow one another too quickly. Generally, however, the hay may be allowed to remain a few hours in the windrows before putting into the cocks. Generally the hay will be ready to stack in two or three days. In cool weather the time will be longer. If the hay is not thoroughly dry before stacking, heating may result, and the stack may become mouldy.

If the stems are at all sappy, or moisture can be wrung from them under pressure, stacking must be delayed. When the hay feels crisp in the hand, and yet pliable, it is in good condition for stacking.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Green Manure.

The benefits accruing from growing a cover crop for green manure are everywhere recognised. The crop should be planted as soon as possible after the early autumn rains have prepared the ground for the plough. As the crop makes no growth in winter, and very little in the spring-time, and as it is advisable to plough it in as early as possible in spring, a good and abundant growth in the autumn is advantageous; consequently, the earlier the crop is planted, the greater the amount of herbage there will be for manurial purposes.

The crop may be sown towards the end of February. A leguminous crop should be preferred before any other, owing to the amount of nitrogen which this class of plant contains. The sowing will need to be a plentiful one, as it is well to have a good dense growth. Field peas, tares, or vetches are generally sown for this purpose. In some instances the tick bean has also been used with good success. In ordinary orchard soils it is often advisable to sow 1 cwt. each of bonedust and superphosphate per acre, to stimulate the crop into a quick and good growth.

Fumigation.

Citrus and other evergreen trees that are attacked by scale insects should be freed from the scale at this time. Although spraying with such mixtures as resin compound, crude petroleum emulsion, lime sulphur emulsion will do good work in keeping scale insects in check, the only effective means is by fumigation. The trees are enclosed in a tent that will prevent the escape of any gas through its texture. The gas is generated inside the tent, and the tent is kept over the tree for a period of from one-half to three-quarters of an hour. The best remedy is hydrocyanic acid gas, which is generated by placing cyanide of potassium in a mixture of sulphuric acid and water. As both the cyanide and gas are deadly poisons, every care should be taken in using them.. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time, or on a cloudy day, and the foliage of the trees must be thoroughly dry.

Young Trees.

Young trees of the citrus family should now be making a good, thrifty growth. The foliage should be glossy, and the general appearance a healthy one. Occasional light waterings, as well as a mulching of grass or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a manure mulch, and, if it has not been previously done, unnecessary growths in the centre of the tree should be removed.

Spraying.

A spray with nicotine solution or with a resin wash may now be given for either woolly aphis or byrobia mite, but only after the crop has been gathered. If these pests are not very prevalent, the spraying may be left until winter, when a good red oil emulsion or a lime-sulphur spray may be given.

Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during these months. The growth of celery should be quick; a fair supply of water and a good, rich, loose soil are helpful to its growth. The plants should be earthed up as they make growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure should be given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds may now be planted out.

Flower Garden.

The flower garden requires a maximum amount of water and of surface cultivation during the month of February. The season is generally a dry one, the air is hot and dry, and hot winds are sometimes prevalent; and it is impossible to expect that so many plants which are now flowering will put forth their best efforts without the aid of ample water and cultivation. The main autumn flowers—cannas, salvias, dahlias, pentstemons, chrysanthemums—and many plants of the herbaceous section are now in full flower or are preparing to furnish their blooms. These will all require ample moisture, and in the case of rapid-growing succulent plants, such as the dahlia, a good mulching with stable or poultry manure is required. Flowering trees and shrubs, such as oleander, poinciania, virgilia, lagerstrœmia, acacia elata, and many others are now in full bloom, and if the gardener has room for any of these, they should be noted for future planting.

Delphiniums should have their old flowering stems cut down, so that they may give another succession of autumn blooms. The plant should be well mulched and watered after cutting the old stems.

Carnations may be layered, keeping the layers continually moist and cool until they root. Cuttings of all pelargoniums, zonale and regal, may now be planted, and seeds of perennial and hardy annuals may be sown. Included among the seeds to be sown are those of the sweet pea, wallflower, Iceland poppy, anemone, ranunculus, stock, and pansy.

Beds and plots for the planting of daffodils, hyacinths, and other spring flowering bulbs should be thoroughly dug and worked over, and the subsoil should receive a good soaking.

Chrysanthemums should be thinned out and staked, if this has not previously been done. The floral buds should be selected and all others pinched out, and the plants should then be fed whenever necessary.

All old flower heads should be removed from the rose bushes. In March the plants may be thinned out, manured, and generally prepared in anticipation of the crop of autumn blooms.

All shrubs and trees that have bloomed should have their old flowering stems and shoots thinned out, so as to start fresh growths for filling in spaces, and for next year's blooms.

IN reply to a correspondent, Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, has furnished the following information:—

1. *Amount of seed per acre to produce highest results* varies with many conditions, such as:—

   (*a*) Stooling capacity of seed.
   (*b*) Variety of grain sown.
   (*c*) The tilth of the land and its freedom from weeds.
   (*d*) Whether sown early or late. The earlier the sowing the less seed is wanted.
   (*e*) Rainfall of district. The lower the rainfall the less the seed.

In Mallee 40-50 lbs., and Wimmera, 50-60 lbs. of seed per acre give best results. In the North-East, Central, and Western Districts, 60-70 lbs. of seed give best returns.

2. *The highest known number of stools per grain of wheat:*—

   There are usually at least six, but there may be from two to several dozen, in extreme cases as many as fifty-two spikes have been observed. Time of seeding has great influence, for late sown wheat may not have time to stool.

3. *The highest number of grains per head:*—

   Major Hallet, a noted wheat breeder, records that the best head of wheat examined by him contained 123 grains.

4. *Average number of grains to bushel:*—Varies from 446,580 to 971,940.

	Number of grains per— lbs.	bushel.
Wheat	10,500	630,000
Barley	15,400	862,400
Oats	20,000	800,000

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

MONTHLY REPORT ENDING 14TH JANUARY, 1915.

The rainfall for the month totalled 311 points. This, coupled with the fact that the thermometer registered as low as 49 deg. on one occasion, and 50 to 52 on several mornings, affected the birds to some extent adversely. A number of birds were moulting, and broodies were numerous during the month.

The health of the birds is first class, and a good egg yield for this time of the year is being obtained.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

LIGHT BREEDS.

WET MASH.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Dec.	15th Dec. to 14th Jan.	Total to date—8 months.	Position in Competition.
25	White Leghorns ..	J. H. Gill	1,163	141	1,304	1
36	,, ..	E. A. Lawson	1,152	147	1,299	2
26	,, ..	Mrs. H. Stevenson ..	1,064	153	1,217	3
9	,, ..	J. J. West	1,054	138	1,192	4
16	,, ..	A. R. Simon	1,054	138	1,192	
10	,, ..	R. Hay	1,045	140	1,185	6
17	,, ..	F. Doldissen	1,007	136	1,143	7
4	,, ..	Giddy and Son	985	144	1,129	8
19	,, ..	Marville Poultry Farm ..	982	145	1,127	9
40	,, ..	J. Schwabb	979	146	1,125	10
33	,, ..	W. G. Osburne	1,006	117	1,123	11
11	,, ..	C. J. Jackson	975	145	1,120	12
37	,, ..	S. Brown	984	129	1,113	13
45	,, ..	H. C. Brock	972	141	1,113	
29	,, ..	V. Little	971	133	1,104	15
35	,, ..	W. Tatterson	960	124	1,084	16
23	,, ..	S. Buscomb	939	139	1,078	17
44	,, ..	A. Ross	964	100	1,064	18
8	,, ..	F. W. Brine	920	138	1,058	19
1	,, ..	F. G. O'Bree	913	144	1,057	20
15	,, ..	E. Waldon	919	130	1,049	21
47	,, ..	W. G. Swift	906	133	1,039	22
30	,, ..	G. W. Robbins	893	144	1,037	23
22	,, ..	B. Mitchell	871	143	1,014	24
24	,, ..	C. Pyke	893	119	1,012	25
28	,, ..	Utility Poultry Farm ..	897	113	1,010	26
20	,, ..	A. W. Hall	852	155	1,007	27
34	,, ..	W. A. Rennie	879	119	998	28
2	,, ..	J. C. Armstrong ..	873	125	998	
12	,, ..	A. H. Mould	879	115	994	30
48	,, ..	Bennett and Chapman ..	848	146	994	
38	,, ..	G. Hayman	854	136	990	32
14	,, ..	F. C. Western	8 4	152	986	33
6	,, ..	C. R. Jones	860	120	980	34
3	,, ..	T. A. Pettigrove ..	867	109	976	35
13	,, ..	H. Hanbury	833	126	959	36
42	,, ..	E. W. Hippe	828	126	954	37
18	,, ..	All-lay Poultry Yards ..	810	136	946	38
41	,, ..	Doncaster Poultry *Farm* .	792	147	939	39
32	,, ..	Gleadell Bros.	819	119	938	40
5	,, ..	A. Mowatt	788	143	931	41
31	,, ..	E. H. Bridge	797	132	929	42
43	,, ..	G. Mayberry	741	143	884	43
21	,, ..	R. A. Lewis	746	125	871	44
39	,, ..	R. L. Appleford ..	729	137	866	45
49	,, ..	A. Beer	719	122	841	46
50	,, ..	F. G. Silbereisen ..	670	137	807	47
27	,, ..	Walter M. Bayles ..	656	117	773	48
7	,, ..	B. Cohen	626	140	766	49
46	,, ..	C. L. Sharman	629	134	763	50
		Total	44,397	6,681	51,078	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Dec.	15th Dec. to 14th Jan.	Total to date—8 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		DRY MASH.				
60	White Leghorns ..	W. N. O'Mullane ..	1,160	141	1,301	1
65	,, ..	E. A. Lawson	1,116	138	1,254	2
55	,, ..	W. G. Osburne	1,008	109	1,117	3
53	,, ..	C. Lawson	982	111	1,093	4
51	,, ..	Moritz Bros.	946	146	1,092	5
58	,, ..	Miss L. Stewart	945	115	1,060	6
61	,, ..	H. Hanbury	920	137	1,057	7
63	,, ..	Hanslow Bros.	862	117	979	8
59	,, ..	F. G. Silbereisen ..	819	154	973	9
68	,, ..	E. W. Hippe	832	136	968	10
62	,, ..	A. Greenhalgh	816	140	956	11
52	,, ..	Myola Poultry Farm ..	817	121	938	12
64	,, ..	G. Carter	801	123	924	13
70	,, ..	W. H. Robbins ..	805	116	921	14
64	,, ..	E. A. Carne	799	121	920	15
60	,, ..	C. J. Beatty	775	127	902	16
57	,, ..	J. Jackson	777	116	893	17
67	,, ..	Walter M. Bayles ..	737	138	875	18
66	,, ..	S. Brown	533	108	641	19
		Total	16,450	2,414	18,864	
		HEAVY BREEDS.				
		WET MASH.				
77	Black Orpingtons ..	J. McAllan	1,055	146	1,201	1
88	,, ..	H. H. Pump	971	138	1,109	2
71	,, ..	J. Ogden	976	128	1,104	3
89	,, ..	*Marville Poultry Farm* ..	988	98	1,086	4
84	Rhode Island Reds	J. Mulgrove	910	127	1,037	5
81	Black Orpingtons ..	D. Fisher	899	102	1,001	6
82	,, ..	J. H. Wright	891	90	981	7
76	,, ..	W. P. Eckermann ..	851	120	971	8
87	,, ..	A. Douglas	836	131	967	9
75	,, ..	Fairdeal Poultry Farm ..	830	117	947	10
74	,, ..	S. Brown	810	95	905	11
73	,, ..	J. A. McKinnon ..	788	114	902	12
72	,, ..	T. W. Coto	806	91	897	13
83	,, ..	Cowan Bros.	732	86	818	14
85	Golden Wyandottes	J. C. Mickelburgh ..	606	85	691	15
78	Red Sussex ..	Jorgen Anderson ..	592	77	669	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	540	92	632	17
86	Buff Wyandottes ..	W. G. Swift	405	68	473	18
		Total	14,486	1,905	16,391	
		DRY MASH.				
100	Black Orpingtons ..	D. Fisher	878	88	966	1
90	,, ..	J. H. Wright	819	93	912	2
97	,, ..	Jas. McAllan	798	97	895	3
98	,, ..	A. Greenhalgh	800	94	894	4
94	,, ..	T. W. Coto	765	65	830	5
91	,, ..	C. E. Graham	719	105	824	6
96	Rhode Island Reds	Myola Poultry Farm ..	693	114	807	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	674	95	769	8
93	,, ..	Myola Poultry Farm ..	653	94	747	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	530	92	622	10
95	,, ..	C. L. Bewitt	357	72	429	11
		Total	7,686	1,009	8,695	

A. HART,
Chief Poultry Expert.

Department of Agriculture,

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 3. 10th March, 1915.

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

Introductory.

The production of maize for grain in Victoria has not developed as fast as might have been expected, the area cultivated being small when compared with the suitable land available in various parts of the State for such purposes. The rich flats on either side of the numerous rivers and creeks north and south of the Main Dividing Range lend themselves as specially valuable to maize growing, partly owing to the class of soil provided and also to the climatic conditions prevailing; the rainfall is sufficient and the summer season long enough and hot enough to ripen the crop. Where temporary dry spells are experienced, water for irrigation is generally available; this factor alone gives promise of a greatly extended area being cultivated when fuller advantage is taken of the permanent water supply. Already, in a small way, in more or less isolated cases, the crop has been profitably produced on such rivers as the King, Ovens, Kiewa, Mitta, Upper Goulburn, Upper Murray, and their many tributaries, and with a better knowledge of the crop's requirements and better systems of cultivation, seed selection and adaptation of varieties to their environment, undoubtedly still more profitable results will ensue.

At the present time the flats on the Snowy River at Orbost, the Tambo at Bruthen, and the Mitchell at Bairnsdale, are the heaviest maize yielders. This is largely due to the exceptionally rich nature of the soil and suitable climatic conditions. However, one cannot but be impressed with the fact that better systems are adopted here than in many other districts, which tend to bring about better results. Experience has, no doubt, had much to do in this respect; but, in addition, Eastern Gippsland has had the benefit of the time and thought which

some of the leading growers have devoted to the general improvement of the crop. Messrs. H. James (of Orbost) and Seehusen (of Bruthen), and others, have experimented for many years in methods of cultivation, seed selection, &c., and increased yields and better profits have resulted. There is no doubt that many other districts can be materially assisted in this respect if the same methods are applied.

Literature on maize culture is difficult to obtain, especially for local application, and the more knowledge the grower can employ and utilize with practice the greater chance will he have of obtaining maximum results under all circumstances.

The following figures, taken from the *Victorian Year-Book*, 1912, show the areas under cultivation in years 1906-7 to 1911-12:—

Maize Areas and Yields for Victoria.

Year.	Acres.	Yield.
		Bushels.
1906–7 ..	11,559	704,961
1907–8 ..	10,884	508,761
1908–9 ..	14,004	650,642
1909–10 ..	19,112	1,158,031
1910–11 ..	20,151	982,103
1911–12 ..	18,223	792,660

In the year 1901-2 there were 10,020 acres under maize, from which a return of 615,472 bushels was obtained. After that year the area of land under this crop was fairly constant until 1909-10, when it was increased to 19,112 acres, which produced 1,158,031 bushels. In 1910-11 the area was further increased to 20,151 acres, but the production was only 982,103 bushels. In 1911-12 the area declined to 18,223 acres, and the produce to 792,660 bushels, of which 225,860 bushels were in the county of Tanjil, 174,024 in Dargo, 159,562 in Tambo, 156,960 in Croajingolong, 23,217 in Bogong, 17,445 in Bulu Buln, 11,240 in Benambra, 8,783 in Mornington, 8,421 in Grant, and 3,360 in Delatite. Maize is grown in other counties of the State, but to such a small extent that it accounted for only about ½ per cent. of the total production last season.

Maize.

1. *States Growing Maize.*—The only States in which maize is at all extensively grown for grain are those of New South Wales and Queensland, the area so cropped in these two States during the season 1911-12 being 321,628 acres, or nearly 95 per cent. of the total for the Commonwealth. Of the balance, Victoria contributed 18,223 acres, South Australia 97 acres, Western Australia 29 acres, and the Northern Territory 19 acres. The climate of Tasmania prevents the growing of maize for grain in that State. In South Australia prior to 1908 particulars concerning maize had not been specially asked for on the form used in the collection of agricultural statistics. In all the States maize is grown

to a greater or less extent as green forage, particularly in connexion with the dairying industry.

AREA UNDER MAIZE, 1875-6 TO 1911-12.

Season.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Northern Territory.	Federal Capital Territory.	Commonwealth.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres
1875–6 ..	117,582	2,346	38,711	..	60	..	..	158,699
1880–1 ..	127,196	1,769	44,109	..	32	..	..	173,106
1885–6 ..	132,709	4,350	71,741	..	120	..	..	209,100
1890–1 ..	191,152	10,357	99,400	..	81	..	..	300,990
1895–6 ..	211,104	7,186	100,481	..	23	..	..	318,794
1900–1 ..	206,051	9,389	127,974	..	91	..	..	343,505
1905–6 ..	189,353	11,785	113,720	..	43	..	..	314,901
1906–7 ..	174,115	11,559	139,806	..	101	..	..	325,581
1907–8 ..	160,980	10,844	127,119	*549	87	..	..	299,579
1908–9 ..	180,812	14,004	127,655	1,223	181	..	..	323,875
1909–10..	212,797	19,112	132,313	210	153	..	..	364,585
1910–11..	213,217	20,151	180,862	619	46	19	..	414,914
1911–12..	167,712	18,223	153,916	97	29	19	69	340,065

* Particulars for previous years not available.

3. *Total Yields.*—The average yield per acre of this cereal, in common with the majority of crops, evinced a considerable falling off in the season 1911-12, the quantity harvested—9,039,855 bushels—being some 70 per cent. of the production of the previous season. The 1910-11 crop was, however, a record one, and exceeded 13,000,000 bushels. The average annual production of maize during the last decade was 9,078,678 busbels.

4. *Average Yield.*—In the following table particulars are given of the average yield per acre of the maize crops of the several States for the seasons 1901-2 and 1907-8 to 1911-12:—

AVERAGE YIELD OF MAIZE PER ACRE, 1901-2 AND 1907-8 TO 1911-12.

Season.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Northern Territory.	Federal Capital Territory.	Commonwealth.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1901–2 ..	22·98	61·42	21·96	..	10·16	..	..	23·86
1907–8 ..	28·13	46·92	24·34	*11·41	12·41	..	..	27·16
1908–9 ..	28·85	46·45	21·68	15·57	11·80	..	..	26·72
1909–10..	33·36	60·59	18·96	16·00	14·64	..	..	29·54
1910–11..	35·62	48·74	24·66	10·30	15·61	23·63	..	31·44
1911–12..	27·47	43·50	23·63	15·36	13·83	21·05	11·52	26·58
Average for 10 Seasons	28·71	55·20	21·13	†13·54	13·44	..	..	26·84

* Particulars for previous years not available. † Average for five seasons.

The extraordinarily high average yield obtained in Victoria is due, in large measure, to the fact that the area under maize in that State is comparatively small, and is situated in districts that are peculiarly suited to the production of this grain. The yield in New South Wales is appreciably higher than that obtained in Queensland.

A 2

5. *Value of Maize Crop.*—The value of the Commonwealth maize crop for the season 1911-12 has been estimated at £1,637,692, made up as follows:—

VALUE OF MAIZE CROP, 1911-12.

Particulars.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Northern Territory.	Federal Capital Territory.	Commonwealth.
Aggregate Value	£1,013,971	£168,440	£454,695	£242	£85	£80	£179	£1,637,692
Value per Acre ..	£6/0/11	£9/4/10	£2/19/1	£2/9/11	£2/18/7	£4/4/3	£2/11/11	£4/16/4

AUSTRALIAN AND FOREIGN MAIZE PRODUCTION.

The following table gives the production of maize in Australia and in the leading maize-producing countries of the world. The figures show that of the total production the United States of America was responsible for 75 per cent.:—

PRODUCTION OF MAIZE IN VARIOUS COUNTRIES, 1910.

Country.	Production of Maize.	Country.	Production of Maize.
	Bushels.		Bushels.
United States	3,030,691,320	Servia	30,799,064
Hungary	199,046,208	Bulgaria	26,462,432
Mexico	184,870,296	Spain	25,534,528
Argentine Republic ..	163,463,336	Canada*	18,726,000
Rumania	100,461,424	Austria	16,215,600
Italy	94,914,528	Australia	13,044,081
Russian Empire ..	72,207,000	Uruguay	6,377,400
Egypt	65,589,536		

* Exclusive of British Columbia.

8. *Comparison of Yields.*—The average yield per acre of maize in the Commonwealth, of nearly 31½ bushels, may be regarded as highly satisfactory when compared with that of other maize-producing countries. Canada and Egypt are the only countries showing a higher average. The majority of the remaining twelve countries shown in the following table had average yields per acre ranging from 20 to 28½ bushels, while others were as low as 11½ and 14:—

AVERAGE YIELD OF MAIZE IN VARIOUS COUNTRIES, 1910.

Country.	Average Yield per Acre.	Country.	Average Yield per Acre.
	Bushels.		Bushels.
Canada	*57·00*	Servia	21·31
Egypt	34·26	Austria	21·21
Australia	31·44	Rumania	20·48
Hungary	28·47	Russia	19·73
United States of America ..	26·58	Bulgaria	17·52
Italy	23·71	Mexico	13·83
Spain	22·77	Uruguay	11·42
Argentine Republic ..	22·02		

9. *Oversea Imports and Exports.*—Except in the years 1902 and 1903, when, owing to the severe drought experienced in Australia, many of the maize crops failed, the Commonwealth oversea trade in maize has been practically insignificant. In the former of the years mentioned nearly 2,000,000, and in the latter considerably more than 1,000,000, bushels were imported. In 1908 and 1909 also, owing to the small harvests of seasons 1907-8 and 1908-9, the imports of maize were largely in excess of the exports. Details of imports and exports for the past ten years are as follow:—

COMMONWEALTH IMPORTS AND EXPORTS OF MAIZE, 1901 AND 1907 TO 1911.

Year.	Imports.		Exports.		Net Exports.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Bushels.	£	Bushels.	£	Bushels.	£
1901	188,423	24,764	533	75	*187,890	*24,689
1907	31,327	5,541	43,429	6,220	12,102	679
1908	271,723	49,291	2,018	444	*269,705	*48,847
1909	628,063	104,367	5,054	999	*623,009	*103,368
1910	133,730	19,554	12,557	1,904	*121,173	*17,650
1911	31,764	4,925	19,914	3,438	*11,850	*1,487

* Signifies net imports.

The principal countries to which maize has been exported from the Commonwealth are South Africa, New Zealand, and China, while the principal countries from which importations have taken place are the Argentine Republic, New Zealand, the United States, the Pacific Islands, South Africa, and Java.

10. *Prepared Maize.*—A fairly large quantity of corn-flour is imported annually into the Commonwealth, the principal countries of supply being the United Kingdom and the United States. During the year 1911 these importations amounted to 449,744 lbs., and represented a value of £7,142.

11. *Price of Maize.*—The average wholesale price of maize in the Sydney market is given in the following table for each of the years 1902 to 1911:—

AVERAGE PRICE OF MAIZE PER BUSHEL, 1902 TO 1911.

Particulars.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average price per bushel	4 10	4 1	2 4	3 3	3 0	3 2	4 7	4 2	2 11	3 0

Average, 3s. 6½d.

The largest area under maize in 1910-11, viz., 20,151 acres, is small compared with the amount of land in the State capable of producing the crop profitably.

The average yield in Victoria is considerably higher than in any of the neighbouring States, being 55.20 bushels per acre; the next best is New South Wales, 28.71, while Queensland 21.13, South Australia 13.54, and Western Australia 13.34, come a long way down the list. Even the mean average of the United States of America, the largest maize-producing country in the world, is only 25.16 bushels per acre—less than half that of Victoria. The mean average of South Africa is 23.20 bushels. These figures suggest that Victoria should be capable of producing greater quantities of maize, in doing which she could afford to bring down her average considerably, and yet hold her own with the leading maize-growing countries of the world. Yet leading growers assert that her present yield could easily be increased by 10 bushels per acre under proper management, consequently it should be possible to grow greater quantities and, at the same time, maintain the average yield.

Taking the average price of maize in years 1902-11 inclusive (3s. 6½d. per bushel), and the mean return of 55.20 bushels per acre, the return equals £9 4s. 9d. per acre.

It will readily be seen that the cost of growing maize will vary according to the size of the crop and general conditions under which it is worked, but an average of £4 per acre should cover the cost of producing a 55-bushel crop ready for market, including bags, picking, carting, and cultivation, leaving an average net profit of £5 4s. 9½d. A nice return, taking good and bad seasons together, and, at the same time, realizing that much of the expenditure incurred would not leave the grower's pockets should he decide to do the work himself. There are authentic cases of individual yields reaching as high as 140 bushels per acre, and on such occasions the profits are very satisfying.

In districts remote from a railway, maize is fed to pigs, and in that way walked to market instead of being carted, and when the price falls below 3s. per bushel it would probably pay better to feed in this way than to sell as grain, even to nearer markets. On the Cann River, in North-Eastern Gippsland, practically all the maize grown is utilized in this way, and pigs are travelled distances of over 100 miles to the railway station. Twelve miles per day is considered good travelling, and the loss in value due to the effect of the journey is estimated to be 5 per cent. on the pig. It is not unusual to see droves of 600 to 1,000 pigs brought in in this manner, the system adopted in droving being to send a waggon ahead loaded with maize cobs, which are dropped in front of the pigs as an inducement to follow. Drovers keep stragglers up with the mob, while a spare waggon is in attendance to carry any pigs that knock up or receive injuries that may temporarily prevent their travelling. Land 100 miles and more from a railway carries a value per acre of from £8 to £15, owing to the profits made through the combined pig and maize industry. Other remote portions of the State might well be turned to good account in the same way.

Apart from the ordinary uses for which maize is grown in Victoria, there are possibilities of various other industries being developed through the growth of this crop, perhaps the most important of which is the

manufacture of sugar from such sources, on which subject Mr. F. T. Stewart, Murrysville, P.A., U.S.A., supplies the following interesting matter on the subject of "Maize and its New Uses," and "The Structural Peculiarities of Maize and their Relation to the Practical Extraction of Sugar Under the New Treatment":—

"Maize and the sugar cane are much more closely related to each other than they are to grasses of the bamboo type. But in all, the fundamental element or unit of structure is the same—the node and its connected parts, the internode and germative bud. In its present form the sugar cane has the habit and characteristics of a perennial grass—maize that of an annual. It is no discredit to the former to say that almost a century ago Sir Humphrey Davy discovered that the common tussock grass, or cocksfoot (*Dactylis glomerata*), which often invades the cultivated sugar cane fields, in all particulars except size is the nearest akin to the sugar cane—a disreputable poor relation of the latter—which unasked comes to court its company and share its fortune. Davy found it to contain 18 per cent. of sugar. The fact is that normally all the grasses contain sugar. Cane sugar is the highest product of plant metabolism—out of it even cellulose is formed—and the sugar is the common food material, formed and stored principally within the culms or stalks of all the grasses. The normal sugar content in most species does not exceed 6 or 7 per cent. But I find that in the case of many of the annual grasses a forced accumulation of sugar may be produced when they are grown under slightly abnormal conditions.

"This paves the way for the statement of what is now not only a legitimate generalization, but an accepted fact—that maize under certain conditions of growth and development is *potentially a sugar cane.*

"Both maize and the sugar cane are so constituted structurally and functionally as to enable them to form and store away the food materials upon which their continued growth and existence depend. This they do in obedience to the same inexorable law, and for the same purpose which leads the bee to store up honey within the cells of its hive. Due regard to economy will have it that the amount of the food supply shall be proportioned on a liberal estimate to the future demand that will be made upon it; just as in forming the crowded hexagonal cells of both plant and comb, regard is had to the use of the smallest quantity of the elaborated cell-forming material—the wax or the cellulose—that will give the largest storage capacity within a given space. But the parallel between the two cases does not end here.

"The supreme crisis of its life comes to the corn plant when the immature ear is removed or destroyed. Promptly in that case, and heroically as we would say, if we think of it as an intelligent creature, an effort is organized to meet the emergency, to repair the loss, and to avert the impending catastrophe. To this end a reserve force, which never in the ordinary life cycle of the plant has any such demand made upon it, is then called into action.

"In brief, the result is that the plant at once enters upon an entirely new condition of development, and its efforts are rewarded with an indefinite prolongation of its life, with the purpose plainly of maturing a new ear; fresh stores of the precious food materials are produced with amazing rapidity, and rushed into the natural receptacles provided for them within the stalk, until the sugar has accumulated beyond 100 per

cent. more than it originally contained. It is scarcely necessary to say that this transformation is brought about effectively only under human control directed closely to the end in view. The results in sugar accumulation are then as uniform and constant as in the sugar cane in the tropics. In maize, the stalk is a column composed of successive "joints" (the nodes and internodes), which, in their intergrowth, are permanently fused together, so that when combined they constitute a single individual. In sugar cane the joints, when mature, have no vital connexion with each other, and each may be regarded as a separate individual. In cane, the reserve sugar is distributed quite uniformly through the pith cells or parenchyma of the internodes, but little of it is found in the nodes. In maturing, the joints ripen successively from the foot of the stalk upward. In maize, on the contrary, the sugar is stored in the greatest abundance within and directly above and below the node, and at that time there is a constant interchange and distribution of this material as it is formed throughout the whole length of the stalk, the upper joints—except the last two—maturing at the same time as the lower. Equally important with the sugar is the pulp and cellulose product, consisting of the substance of the whole stalk in a highly purified condition after the sugar has been extracted, the whole of it ready to be reduced at once into the finest quality of pulp and cellulose. On account of the absence, in this case, of the hard silicious coating which covers the cornstalk when the grain has ripened, and which prevents the best of the fibrous matter, which it contains, from being utilized, the pulp obtained is doubled in quantity and is of a much superior quality.

"A necessary incident to the sugar process is the removal of the immature ears and husks from the stalk. This field stuff amounts to about 80 per cent. of the weight of the stalk, and adds a third class of products obtained from the same plant, utilized principally in the manufacture of food products and alcohol.

"The discovery of the fact that Indian corn can be made available for sugar production, and that under the proper conditions of treatment it takes at least equal rank with sugar cane and the beet for that purpose was demonstrated conclusively ten years ago. It was found that the plant then is enabled to develop a latent and hitherto unsuspected power which it possesses of transforming a large part of its other organic constituents into true sugar. Accurate tests of the sugar content of the juice of the best varieties of field corn grown in different parts of the United States have been made continuously from the year 1897 until the present time. During the seasons of 1898 and 1899 and 1900, the final crucial tests were made, which ended all controversy as to the capacity of the plant under the given conditions to produce not less than an average of 13 per cent. of sucrose, or true cane sugar, in the juice as a constant. Since then, the investigation has been extended over the whole field of the proper utilization of the plant which the first discovery was seen to open up. One thing is now plain. The development of this business is yet in its earliest infancy. What the final outcome shall be can scarcely be foreshadowed. But it is safe to say that the limit of the value of the plant in no single direction has yet been reached. The fine results reached in the work at the experimental plant at Murrysville the past season, and the final tests of the machinery, prepare the way for

the rapid introduction of the processes into regular use next year on the most extensive scale, wherever corn can be grown to the most advantage for these purposes. From refined maize cellulose, the same as from cotton, all the standard products are now producible at low cost, which are indispensable for common use and in the arts—such as collodion, celluloid goods, sizing and surfacing and paper-filling preparations, varnishes, transparent films, carbon filaments for incandescent electric lights, artificial silk, gun cotton, smokeless powder, cellulose solutions, &c., &c."

(To be continued.)

THE mangel, the sugar-beet, and the garden-beet are all improved modifications of the same original wild plant; its natural *habitat* is the sea-shore; and it wants some salt.

MANGELS improve by storing for a month or two before use.

EXCEPT on very rich soils mangels require nitrogen as well as phosphates in their manure. A little common salt applied broadcast helps them on.

FRUIT FORWARDED TO NEW SOUTH WALES.

UNIFORM SYSTEM OF BRANDING.

Owing to the difficulties which have been experienced in connexion with the transport of fruit forwarded from Victorian stations to Sydney, and in compliance with certain representations which have been made by the Fruit Section of the Sydney Chamber of Commerce, it has been decided by the Victorian Railway Commissioners to introduce a uniform system in connexion with the branding of cases, with a view to facilitating the transhipment at Albury and delivery at Darling Harbor, and the following instruction in regard thereto has accordingly been issued to the stations concerned:—

"When truck-load consignments are forwarded by one sender to one consignee, the cases should be stencilled at each end with an over-riding brand, independently of any brands or addresses which may be shown for the information of the consignee (or agent) in effecting deliveries of consignments that are forwarded for distribution.

"It is advisable that the over-riding brand should be the first initial of the consignee's surname, also a figure to denote the day of the week, for instance:—A consignment of 350 cases forwarded to Smith and Son on a Wednesday should be stencilled S.3.

"The notice of any likely senders is directed to this matter, with a view to obtaining their co-operation in carrying out the arrangements, as no notice will be taken of different brands for the one consignment."

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Bee Expert.

(Continued from page 71.)

XXVI.—THE HONEY FLORA—(*continued*).

The Messmate (*Eucalyptus obliqua*)

(Fig. 15.)

The Messmate, in South Australia and Tasmania called Stringy Bark, is generally a straight stemmed tree of rapid growth attaining a maximum height of 300 feet in country with a good rainfall, usually found in the company of Stringy Bark (*E. macrorrhyncha*) and Peppermint (*E. amygdalina*), but also occurring in a stunted form on sandy heath ridges, with Apple Gum (*E. Stuartiana*) and Brown Stringy Bark (*E. capitellata.*)

The wood is pale to brownish yellow in colour, usually free in the grain and then used for splitting into posts and rails and to a lesser extent into palings and shingles, it also supplies a large portion of the ordinary sawn hardwood for building purposes.

The bark is very fibrous but rather soft and fragile, inside light brown, outside greyish or after fires black; it ignites easily and the Messmate therefore carries bushfires along more than most other trees. The bark is to some extent used for roofing rough buildings, but is not so suitable for this purpose as that of Stringy Bark.

The leaves are scattered sickle—or sickle lance-shaped, equally green and shining on both sides; their lateral veins not very spreading, but rather prominent, the marginal vein somewhat removed from the edge of the leaf. The leaves of young saplings are broad, somewhat heart-shaped.

The clusters (umbels) contain from three to twenty flowers, and grow from the shoulders of leaves or sideways from the branchlets. The stalks of the umbels are slender and rather long, the flower buds long, tapering towards the stalk, and have a half-round or slightly pointed top. The fruit is cup-shaped with three to five cells (compartments).

The buds appear from nine to eleven months before blossoming, which takes place generally in February. The honey is one of the darkest, particularly so in wet locations, reminding somewhat of molasses. Pollen is gathered by the bees from the blossom, and as the Messmate blooms late in the season it may be found useful in building up colonies for autumn and supplying them with winter stores.

The Brown Stringy Bark (*Eucalyptus capitellata*).

(Fig. 16.)

This tree attains a maximum height of 200 feet, but, as a rule, is not so tall. It is widely distributed over Victoria, appearing in the Eastern and moister half as a tall tree, but near the Grampians and the South Australian border in a dwarf state. It furnishes a good timber for all purposes for which Stringy Bark is used.

The bark in appearance resembles that of Messmate, but is harsher and more stringy, and reaches far up into the branches, the branchlets alone being smooth.

The leaves are lance-shaped, or lance slightly sickle-shaped, rather thick, dark green, usually more shining on the upper than the lower side; the lateral veins moderately spreading, the marginal vein distinctly removed from the edge.

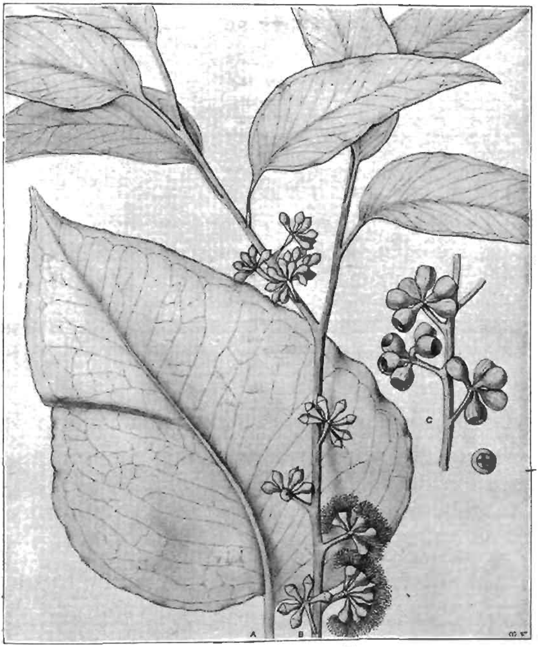


Fig. 15.—The Messmate (*Eucalyptus obliqua*, L'Herit.).

The umbels are in sprays at end of branchlets, or single lateral or at shoulders of leaves bearing from four to fifteen flowers, not of large size. The buds taper only slightly towards the stalk, while the top is rounded or blunt-pointed. The fruit is almost round with the points of the crown well projecting and of a dark-brown colour when the fruit is dry.

The buds appear fifteen to eighteen months before flowering, which occurs two years in succession, in February and March, so that for some time there are two generations in sight. This is also a characteristic of the Red Stringy Bark (*E. Macrorrhyncha*), Manna Gum (*E. viminalis*) and Long-leaved Box (*E. elæophora*). As a nectar-producing tree it is not very reliable, being like the Red Stringy Bark, somewhat

Fig. 16.—The Brown Stringy Bark (*Eucalyptus capitellata*, Sm.).

irregular, failing altogether some years, particularly in dry districts. It is, however, very useful as a pollen bearer.

The honey is one of the darker ones, but fairly clear, of good density and pleasant flavour, and preferred to other honey by people used to it. When heated it throws off a considerable amount of froth, and as it is inclined to candy it should always be heated to 160 deg. Fahr.

before it is drawn into tins for market, otherwise a layer of froth will be found on top of the honey some time after it is tinned.

The Brown Stringy Bark differs from the Red (*E. macrorrhyncha*) chiefly in the smaller flowers, blunter or less pointed, and somewhat angular buds of the first-named, while the projecting valve flaps of the ripe fruit which are common to both separate them from other Stringy Bark trees.

THE RED STRINGY BARK (*Eucalyptus macrorrhyncha*).

(Fig. 17.)

The common Stringy Bark tree of Victoria, widely distributed over the State, found generally on comparatively sterile ridges and ranges. It does not attain the height of Messmate (*E. obliqua*), nor does it ascend generally to the high elevations at which the latter is found. Both trees, however, frequently occur intermingled; it generally grows in the company of Red Box, Grey Box, Yellow Box, and Long-leaved Box in the drier districts, and with Manna Gum and Narrow-leaved Peppermint (*E. amygdalina*) in other situations.

The wood is hard, mostly of a deep reddish brown colouration, but also occurring pale in colour; it is durable, free in grain, and therefore split into palings, shingles, and fence rails; it is also sawn into commercial timber, and furnishes a fair fuel. The bark is thick, fibrous, and tough, from light to dark-grey in colour on the outside, reddish-brown inside; the inner layers are so tough as to be available for rough cordage.

The leaves are scattered on the branchlets, lance-shaped, equally green on both sides, the veins moderately spreading, the marginal one distinctly removed from the edge. The umbels or clusters of from four to nine flowers occur mostly singly; the buds sharply pointed, tapering sharply towards the point as well as the stalk; the fruit is round, three and less frequently four celled.

Like the other Stringy Barks, it is not a very reliable tree as a honey-producer, but yields better in Gippsland and moist localities generally than in the drier parts of the State. The honey is clear, but rather high-coloured, but of good flavour, and when thoroughly ripe, of fair density; it candies rather readily, but not solidly, and should always be heated to 160 deg Fahr. before being marketed, otherwise a froth will form on top of the honey after it has been standing for some time. Pollen is gathered from the blossom; the normal flowering time is February, and the buds appear from fifteen to eighteen months previously.

The Red Stringy Bark is more subject to periodical ravages by the caterpillar of the cup moth than any other Eucalypt. Square miles of forest are sometimes devastated by these pests, the value of the trees to the beekeeper being destroyed for several years. The trees themselves are much injured.

THE WHITE STRINGY BARK (*Eucalyptus eugenioides*).

(Fig. 18.)

A tree with a straight stem attaining a height of about 200 feet, occurring mostly in elevated poor grounds, but also in sandy low lands from the Dandenong Ranges and their vicinity to hilly and mountainous places in Gippsland and to Twofold Bay.

The wood is pale coloured, splits well into shingles, palings, rails, and slabs, and is also sawn into building timber; it is more lasting than that of the Red and the Brown Stringy Bark, but is inferior for fuel.

The bark is fibrous, very tough, reddish-brown inside, and is the best kind for rough roofing, and on this account thousands of straight

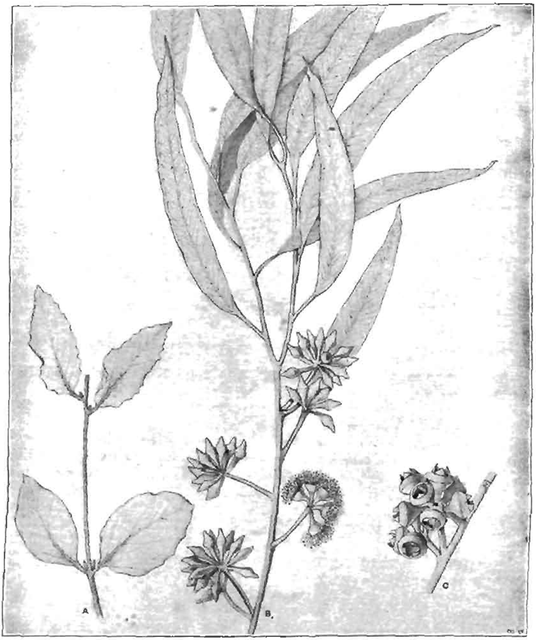


Fig. 17.—The Red Stringy Bark (*Eucalyptus macrorrhyncha*, F. v. M.).

valuable timber trees have been destroyed, one single sheet of bark being taken off the standing tree.

The leaves are scattered on the branchlets, broad lance or slightly sickle-shaped, dark-green and shining on both sides, the veins somewhat faint, the marginal vein somewhat removed from the edge. The flowers four to twenty in single umbels at shoulders of leaves, or sometimes in a small spray; buds conical, fruit cup-shaped, but without the projection of the valve flaps of the Red and Brown Stringy Bark ripe fruit.

The White Stringy Bark blossoms in January and February. Nothing definite is yet known as to the length of time it is in bud, and how often it flowers. It yields pollen to bees. The honey, like that of other Stringy Barks, is rather dark, and has the same characteristics.

Fig. 18.—The White Stringy Bark (*Eucalyptus eugenioides*, Sieb.).

THE YELLOW STRINGY BARK (*Eucalyptus Muelleriana*.)

(Fig. 19.)

The Yellow Stringy Bark, so-called because the bark is very yellow when freshly cut; the timber is also yellowish. The stem is straight, rather massive, with moderately spreading branches, and a fibrous dark-grey bark. The leaves of aged trees are lance-shaped, and more or

less unequal sided, rather dark-green in colour, equally shining on both sides, and usually three to five times as long as broad. The seedlings have narrow lance-shaped opposed leaves. In young saplings the leaves are rather broad lance or egg lance-shaped. The stems of saplings and young trees are somewhat smoother than those of other Stringy Barks.

Fig. 19.—The Yellow Stringy Bark (*Eucalyptus Muelleriana*, Howitt.)

The clusters of flowers appear usually solitary; the buds are from three to twelve in the umbels, tapering towards the stalk, the lid (top) half egg-shaped, or half-round, smooth, and occasionally slightly pointed. The fruit is almost half-round, four celled, less frequently three to five celled, indented with small pits, and usually gray-green in colour.

In Victoria the Yellow Stringy Bark has an extensive range in the southern part of Gippsland It also occurs in the Grampians and other places nearer to South Australia. It is a valuable splitting timber, and exceedingly durable in contact with the ground.

As to its value as a nectar and pollen yielder, the character of the honey, time of flowering, no definite information is, so far, available, and the writer hereby invites information on this subject from bee-keepers able to give such in regard to this tree or any other Eucalypt on which the information in these articles is incomplete.

(To be continued.)

SUMMARY OF METEOROLOGICAL OBSERVATIONS,

CENTRAL RESEARCH FARM, WERRIBEE, 1914.

(Supplied by Field Officer G. S. Gordon.)

The following summary of Meteorological Records for the past year at the Central Research Farm, Werribee, will be of interest :—

1.—RAINFALL AND EVAPORATION.

Rainfall.		Evaporation from free Water Surface.	
	inches		inches.
During 1914 (304 points in December)	13·24	During 1913—	46·438
Rainfall during wheat-growing period, 1st May—31st October, 1914	5·09	During 1914—	50·548
Rainfall during 1913 (505 points in March) ..	16·43		
Average for 42 years	20·29		

2.—TEMPERATURES, 1914.

Mean Air Temperatures.	Mean Soil Temperatures.			Range of Temperatures.	
	inches	°	°	°	°
Dry bulb, 59·4° F. ..	1	70·9 max.	50·6 min.	Highest 98·3	Lowest 32·1
Wet bulb, 55·8° F. ..	6	63·6 ,,	52·6 ,,	,, 84·7	,, 39·0
Max., 69·6° F.	12	61·6 ,,	56·8 ,,	,, 78·0	,, 38·8
Max., 48·6° F.	24	60·2 ,,	58·6 ,,	,, 73·5	,, 43·5

3.—HOURS BRIGHT SUNLIGHT, 1914.

There were 1,906·5 hours of bright sunlight, 1914. This gives a daily average of 5·2 hours.

THE WALNUT.

(Continued from Page 80.)

C. F. Cole, Orchard Supervisor.

VARIETIES.

Too much importance cannot be placed upon the selection of a variety, or varieties, when planting out an area of walnuts for profitable nut production. It is far better to delay planting until a suitable variety is obtained than to rush in and plant out unknown seedling trees raised from a mixed lot of nuts obtained from trees of doubtful type or origin.

The cost of producing nuts of a high marketable value from selected types is no greater than producing nuts from trees of poor types having a low or no marketable value.

With the walnut great variation exists in individual seedling trees. It is from this variation that desirable varieties have been, or still may be, established, each variety having originated from one particular tree which was selected owing to its possessing certain qualities. Having discovered a tree with desirable qualities for profitable nut culture, budding or grafting must be resorted to, if the selected variety is to remain true. If the walnut is to be cultivated upon sound lines worked trees from selected seedlings, or established and named standard varieties, must be planted.

The variations which occur in seedlings grown from nuts selected from one individual tree are very marked, not alone does the type of foliage differ, but the growth, vigour, time of becoming vegetative in the spring, the prolificacy of nut production, the quantity of catkins and pollen produced, size, quality, flavour, and colour of the meat (kernel), time of ripening, resistance to diseases, are all dominant features in variation. Although such variations occur, yet there are certain characteristics that may be recognised as belonging to a certain type, *e.g.*, take the old hard-shell type common in Victoria, which produces small, roundish nuts. Although nuts gathered from individual trees vary in size and somewhat in shape, as illustrated in Plate 20, yet there is a certain degree of similarity, showing a fairly uniform type in shape, colour, and growth. The nut in the lower right-hand corner of the illustration is a fairly good example of the true type of this common hard-shelled variety. To secure trees that would produce nuts true to this type, it is necessary to have them worked, as already mentioned under this heading, by budding or grafting from scions taken from the type tree.

If the common practice of sowing the nuts is followed, the variation in size, &c., already depicted in the illustration must be expected.

The writer does not recommend the planting of this common hard-shell variety for profitable nut production. There are far superior

seedlings in every respect that await selection growing in various parts of the State. This example is chosen to warn intending planters against haphazard selection which, if put into practice, will mean future disappointment, financial and otherwise, besides the loss of many years of labour. This variation that occurs in the walnut has played an important part in establishing the walnut industry upon sound lines in California, and should be the basis on which to work in Victoria.

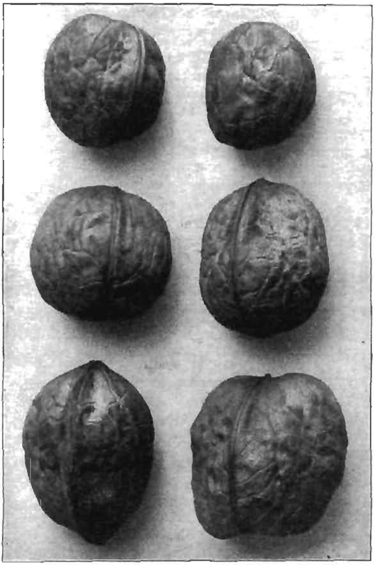


Fig. 20.—English Seedling Walnuts, various types, natural size.

It is partly through variation in foliage that the walnut can be grown to greater success in warm localities, as the selection of a large-foliaged variety is valuable in protecting the developing nuts and wood of the trees from sun-burn. In localities subject to severe late frosts variation again plays its part. The selection of varieties that produce their catkins and pistillate bloom late in the spring makes the production of nuts a greater certainty. Illustrations 21, 22, 23 show three distinct

types of foliage selected from individual seedling trees of the hard-shell type. The difference in variation is so obvious that a minute description is unnecessary. From statements already quoted, the reader will readily recognise that Plates 22 and 23 are both large types. This class of foliage is especially valuable for warm localities, whilst Plate 21 is of a poor, narrow type, affording scanty shade and protection to the nuts, &c. *Because seedling trees have large abundant foliage it is not to say that they will produce large nuts, but when they do so, and the nuts are of high quality, then it is to such a type that the selector should turn.* The writer advocates such a standard type for all climatic conditions where the walnut will thrive. It must be here stated that walnut cultivation has not yet assumed the proportions of an industry, for to the

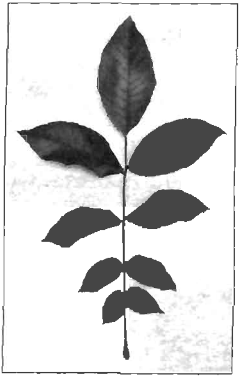


Fig. 21.—Poor Type of Foliage, English Seedling Walnut, quarter natural size.

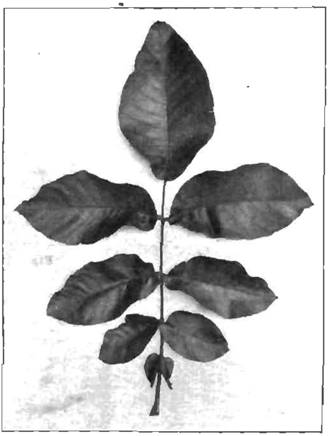


Fig. 22.—Good Type of Foliage, English Seedling Walnut, quarter natural size.

writer's knowledge the pioneering stage upon absolute sound lines has not yet been started. The improvement of the walnut by careful selection, by hybridization or otherwise, is necessarily slow owing to the long time the trees take to come into bearing. *Yet, if the production of this valuable commercial nut is to be upon sound lines, it will be necessary to make a proper start. There are many seedling trees, both hard and soft shelled, in full bearing in the State, and many carefully-selected high-standard varieties which can be imported from California in the form of grafted trees, consequently the field of labour and difficulty of type selection have been greatly minimized, thus saving many*

years of patient waiting to prove or disprove the commercial value of the nuts, and the partial or total resisting powers of varieties to diseases, particularly bacteriosis.

If imported varieties or local seedlings are selected for experimental purposes, a moist locality suited to walnut culture and with bacteriosis prevalent should be selected for proving beyond all doubt the immunity of the selected varieties against this worst disease of the walnut. A warm or dry locality should not be chosen, as the atmospheric conditions during the spring and early summer months are generally unfavorable to the development of the disease, which requires a moist and humid climate. Even if trees are planted and growing in a disease zone, it might be many years before they will show signs of infection. Old trees

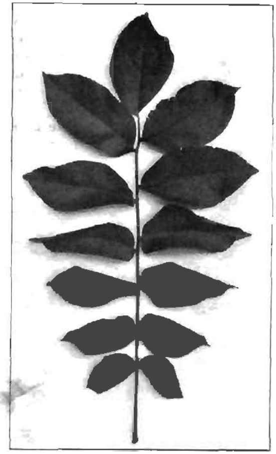


Fig. 23.—Good Type of Foliage, English Seedling Walnut, quarter natural size.

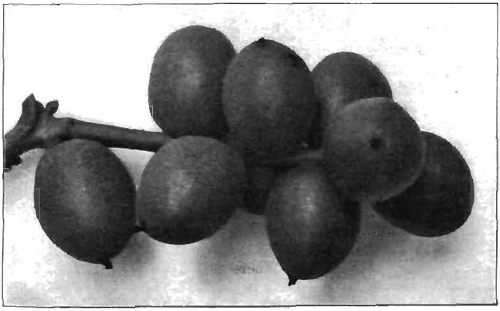


Fig. 24.—A Prolific Cropper (Variety, English Seedling).

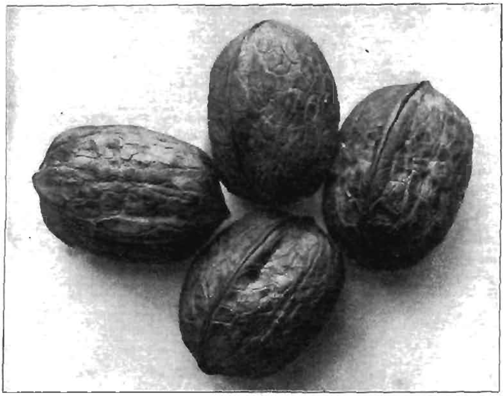


Fig. 25.—Selected English Seedling Walnuts, natural size.

Fig. 26.—Selected English Seedling Walnuts, natural size.

growing in a disease-infested locality bearing crops of good nuts showing no signs of attack upon any portion of the tree may be looked upon as disease-resisting, and should receive attention; likewise those slightly attacked, for, although not totally immune, such trees may be looked upon as reasonably free from attack and far more profitable to grow than trees very susceptible to the disease.

The most important quality to be considered when choosing selected varieties for planting is that of cropping. Whatever other qualities a nut may have, if the variety is a recognised light cropper, it should be discarded. Only varieties producing good commercial crops and regular bearers should be chosen. Another important consideration is the age at which the trees begin to crop, some varieties coming into bearing much earlier than others. Where growing under favorable conditions many seedling trees in Victoria are very prolific, and produce heavy yields of nuts of fair quality. The cluster of developing nuts illustrated in Plate 24 was gathered from a tree that has heavy annual crops, but as it is subject to bacteriosis is not suited to a moist district.

A medium-sized nut, well filled with meat of good quality, is to be preferred to a large nut poorly supplied. Indeed, large-sized nuts do not command as high a price as well-filled smaller ones. Nuts should be of such a size as not to go through a square mesh grader of from 1 inch to 1¼ inches square; they should have light-coloured meat of sweet flavour, the pellicle, or meat coat, should be pale, the shell smooth and free from conspicuous ridges, or grooves, pale and symmetrical, closely sealed, and not easily cracked.

Varieties producing thin shelled nuts easily opened by slight pressure, although probably preferred by the eater, are not so valuable to a grower as the hard-shelled variety, for, during the gathering and drying many nuts open, and the meat is spoilt; others, again, are injured by handling and transit.

That there are seedling trees growing in Victoria producing nuts worthy of attention, and far ahead of the majority of small, ill-shaped hard-shelled types, the two varieties of nuts gathered from old trees shown in Plates 25 and 26 will demonstrate. Plate 25—Description of nut: Oval, elongated and symmetrical, uniform, shell fairly firm, having a smooth surface, colour light-brown, opens somewhat easily owing to being rather poorly sealed at the apex, pellicle or seed coat pale brown, meat plump and well filled, easily extracted, flavour mild and sweet. Dimensions, passed through a hole 1 3-16 inches square with slight pressure. Weight of average-sized nuts, 9 months, stored, 42 to the 1 lb. Avoirdupois, weight of meat from 42 nuts, 10½ ounces; shell 5½ ounces. Plate 26—Description of nut: Rounded, oval, symmetrical, uniform; shell smooth, hard, moderately thick, light brown in colour, strongly sealed, pellicle or meat coat pale straw-colour, meat full and heavy, easily extracted, flavour good, sweet, having a true nutty flavour. Dimensions, passed through a square hole 1 2-16 inches and 1 3-16 inches in size. Although these two types are not so large as the selected Californian varieties, they are well filled nuts, weighty for their size, and of very fair shell colour; the meat is attractive when extracted, and of

good flavour. The smallest nuts gathered from both types did not pass through a ¾-inch square hole. For the benefit of those readers not conversant with the Californian types, a reproduction from Bulletin

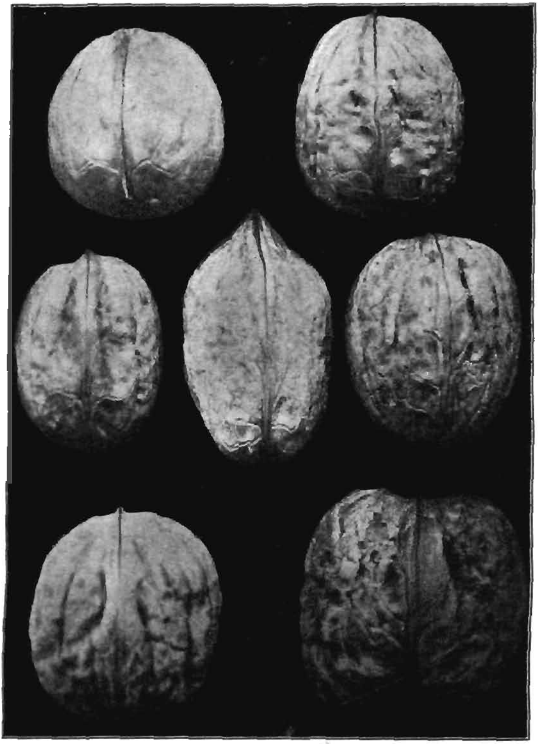


Fig. 27.—Varied Types of Californian Varieties, natural size.

No. 231, Berkley, California, on walnut culture, is shown in *Plate 27.* Victorian seedlings varieties depicted in Plates 25 and 26 can be compared.

The following is a selected list of varieties recommended for introduction into Victoria from America. The young trees to be either budded or grafted:—

Chase—Vegetates early; foliage abundant and thrifty.
Concord—Vegetates late; foliage abundant and vigorous.
Eureka—Vegetates medium late; foliage abundant and thrifty.
Franquette—Vegetates very late; foliage abundant and thrifty.
Placentia—Vegetates early; foliage abundant and thrifty.
San Jose—Vegetates late; foliage rather sparse.

Several of the nuts depicted in Plate 27 are slightly larger than many of the best varieties grown in California and illustrated in the Bulletin.

To be continued.

EFFECT OF DEHORNING.

In an experiment with ten cows at the Kansas Agricultural College it was found that for the first five days after dehorning the cows lost an average of ½ lb. of milk a day. At the end of the fifth day they began to return to their normal flow, and in a few days eight of them were giving a substantial increase. The greatest gain was with the cows that had been hooked and driven away from their feed previous to the dehorning. The two that did not increase in production were the "boss" cows of the herd. Cattle that are dehorned before the coming of warm weather and flies usually heal without any trouble. Much time and trouble is saved by dehorning the calves with caustic potash. This should be done before the calf is a week old, or a stumpy horn will develop, which will have to be removed later with clippers or saw. Scrape the button or young horn with a knife until it is red. Then moisten it and rub it well with a stick of caustic potash, or with household lye, being careful not to get it in the skin around the horn, as it is very irritating to the calf's tender skin. This should be repeated in a few days if a deep scab does not form in the centre of the horn.—*Farmers' Gazette*, 23rd October, 1914.

THE OLIVE.

L. Macdonald, F.R.B.S., F.R.H.S., Horticulturist, Dookie Agricultural College.

(*Continued from page 471, Vol. X., 1912.*)

VARIETIES.

In olive culture, as in the culture of other fruits, there is probably no greater factor in determining the balance of success and failure than the variety. It has long been recognised that the right kind is unquestionably the most effective weapon to put into the hands of the producer. This is especially so where the conditions are such that the maximum of production, even with the best kinds, is not high, owing to the prejudicial effect of soil, or climate, or both, the net returns being diminished owing to the high cost of labour, defective appliances, or where the stress of competition is great.

Hitherto it would appear that the importance of the variety as a factor in the economics of this industry has not been given due consideration. This is evident by the ever-increasing number of varieties, many of which are only moderate oil yielders, and many quite worthless for commercial purposes as well as by their haphazard cultivation and the confusion into which the nomenclature of the olive has fallen. *It would seem by the evidence before us, notwithstanding the fact that the olive has been cultivated for centuries for its oil, that its culture has not been placed on a sufficiently scientific basis to eliminate those considerations that are inimical to the more rapid expansion of the industry.* It has been demonstrated, chiefly in comparatively recent years, that there is a very wide difference in the oil content of different varieties of olives, not only in quantity but in quality. When it is *observed that this difference of recoverable oil in different kinds of* olives may vary between 20 and 40 gallons per ton of fruit (in some cases the difference is even wider), it will be seen that the variation is often wider than the margin between profit and loss. Hence it is of primary importance, in selecting varieties where oil production is in view, that only those varieties with a high recoverable oil content be obtained.

Of course improved methods of culture, and favorable conditions, will always enhance the qualities and characteristics of the kind. In other words, the latent qualities of a variety will often lie partially *dormant under a set of conditions radically different from the average by which its standard was appraised, but when those conditions are removed or modified, the qualities that have been lying quiescent reassert themselves, and may even be greatly augmented, but despite this the type remains unchanged.*

The value of any variety will depend chiefly on :—

(1) Its recoverable oil content (quantity and quality);
(2) Its fruit bearing capacity and habit;
(3) Its constitution and immunity from disease;
(4) Its ability to thrive under the prevailing conditions.

It has been pointed out that it is useless for the producer to endeavour to compete successfully in the commercial field with varieties of low or crude oil qualities. Hence it is of first importance, at the outset, that the planter secure the most suitable varieties for his purpose. There is no more hope of a grower succeeding with some kinds of olives than there is with certain kinds of apples. The limitations of some kinds are such that, even under the most favorable conditions, with all the embellishments that the best of culture may give, they cannot be attended with a satisfactory degree of success.

When making a plantation of oil olives, *i.e.*, olives unsuitable for pickling, it must not be thought that any oil olives will do. That is not so, any variety will not do. They should not only be oil olives but they should be the best oil producers obtainable. In the case of olives, as with some of our other fruits, it would probably be a great advantage to the trade and prospective planters if many varieties were deleted from those listed. The confusion resulting from the continual addition of new kinds with their catalogued descriptions often tends to a lot of indiscriminate planting. No calamity is greater to the grower than to find that, when his trees begin to bear, his varieties are unsuitable, either lacking in oil content, sickly constituted, or shy bearers. And when he should be beginning to reap the rewards of several years of work he has to turn to and practically begin afresh. This has been the experience of a number of growers of other fruits in this State in the past. However, it is to be hoped that it will not be the experience of future olive planters. It is hopeful to know that of late years many of the unhappy mistakes of promiscuous planting have been obviated by the orchard supervisors and by a larger distribution of agricultural information through the press.

It is intended here to bring under notice the great majority, if not all those varieties listed by nurserymen in Australia in their catalogues, and those that were originally introduced into the early plantations. Consideration will then be given to a number of European, American and African varieties that appear to possess desirable qualities. It is very probable that there are many varieties growing adjacent to the shores of the Mediterranean that we have no record of. However, there are sufficient varieties known and enumerated here for all purposes, as far as numbers are concerned the difficulty is always one of elimination. A great number of kinds are recorded in different works that are not mentioned here; many of these with those given below have several synonyms in different countries where found growing in different provinces. It is believed, however, that among those listed in the following pages are the best kinds known to European and American cultivation. The description adopted for identification in the case of those not yet fruiting here are taken from the best sources available. But on the whole the nomenclature of olive varieties appears to be in a very unsatisfactory state, and a good deal of confusion is bound to exist until the whole ground is sifted by a Pomological Committee with International Associations.

When on a tour in Europe, in connexion with the viticultural interests of this State, Mr. F. de Castella also obtained a quantity of interesting and valuable data connected with the olive. In connexion with this

matter of varieties I am much indebted to him for a number of notes on Spanish, French, and Italian varieties which will appear in the following pages; also for further information respecting a number of the kinds, with their synonyms, in cultivation here. The notes referred to are mostly extracts from the works of some of the best known European writers* on the subject. He also informs me that the leading Madrid and Seville nurserymen catalogue only the following kinds as being the best for planting, viz., Gordal, Manzanillo, Sevillano, and Herbequina; while another well-known nurseryman of Barcelona stocks only Bacaruda, Grosal (probably same as Gordal), Herbequina, Olesana, Sevillano and Verdiello. These lists were in force in 1907-8. In regard to the Herbequina, or Arbequina variety which Mr. de Castella introduced here, he informs me that it is not mentioned in Professor Degrully's work on the Olive, and does not appear to be known in France, although strongly recommended as a good cropper and high oil yielder in Spain, especially in Cataluna. It has been fruited for the first time this season at the Dookie Agricultural College. A sample was forwarded to the Director of Agriculture, and tested by Mr. Scott, Chemist for Agriculture, for oil content. The return obtained for the whole fruit was 24.80 per cent. of oil. This is a satisfactory test, and it appears at present as if this will be a useful variety for planting. A further note regarding this variety will be found among those other varieties more recently introduced to this country.

The following varieties have been introduced into Australia, and will be found growing in one or the other of the different States. They are not mentioned in order of preference, nor can the first name given in every case be fully accepted as the correct one, as in some cases one or another of the synonyms given may have greater claims. The names given, however, are those under which the different kinds were introduced into this country. The first four mentioned were introduced into Australia by the South Australian Company in 1844. The next ten given were the original kinds introduced to the Dookie Agricultural College from the south of France. A number of these are given the names of species, but they are all, with possibly two exceptions (lauridolia and buxifolia), only varieties. This error in respect to a number of olive names was due in part to an old writer on the subject adopting specific names for varieties, and many of them have been continued up till the present, and are likely to be retained until the whole question has been sifted by an International Pomological Committee.

Verdale.—Syn., Verdaou, Aventurier, Calassen, Vardago, Verdal, Verdalega, &c. Rather dwarf grower, fruit nearly round, early, remains green until nearly ripe, then turns black, rots easily. Regarded as rather poor, erratic bearer. Oil variable in different soils, of a bland or fatty nature, does not keep well. Makes a fair pickle. This kind appears to be much esteemed by South Australian growers, but is not deemed of much value in France. There is possibly some mistake in the name.

Bouquettier.—Fruit medium to small, a good bearer, ripens fairly regularly; some confusion appears to exist regarding this variety. Some South Australian growers claim that it is a high oil yielder,

*Professor Degrully, Jose de Hildalgo Tablada, Professor Antino Aloi, J. de Guillen-Garcia.

while tests in New South Wales point to the contrary. It is not recognised as a great oil producer in other countries.

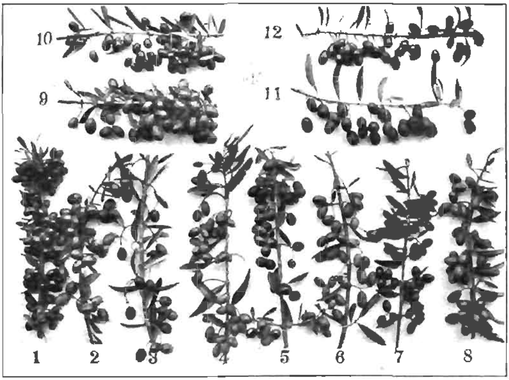


Fig. 25.—Promising Seedling Olives, Dookie Agricultural College.

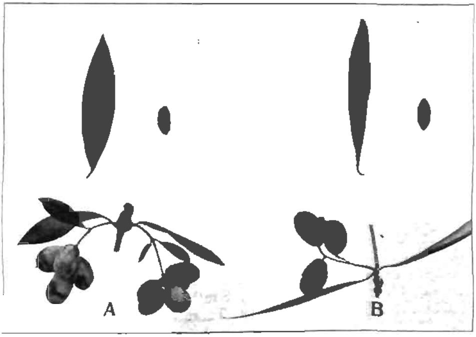


Fig. 26.—A. Olea Uvaria. B. Olea Polymorpha.

Salouen.—Probably from Salonenque, which is known chiefly as Corniale, (Syn., Pendoulier, Courneau, Couchesale) also said to be identical with Cornicabra or Picudo, and resembling Acebuche, which is

widely employed in Spain as a stock. Vigorous growing large trees of weeping habit, robust constitution, long lived, and good for shelter purposes. Good bearer, fruit good size, oval, makes a good quality oil, but does not produce in such abundance as some others. A small variety similar in respects to this kind is known as Petite Corniale.

Blanquette.—Syn., Blancale, Veral blanco, Blankette. Tree weak grower, rather erratic and straggling bearer. Fruit of good size, reddish-black, with small pit; unsuitable for commercial pickling; makes oil of medium quality, but only in poor quantities.

As far as can be ascertained by the writer there seems to be a good deal of uncertainty regarding the identity of the fifth variety originally introduced into South Australia.

Rubra.—Syn., *Rubra caillon. Probably identical* with Caillet, Caye, Cailletier, Cayou, &c. Large, long-lived tree of drooping habit, comes

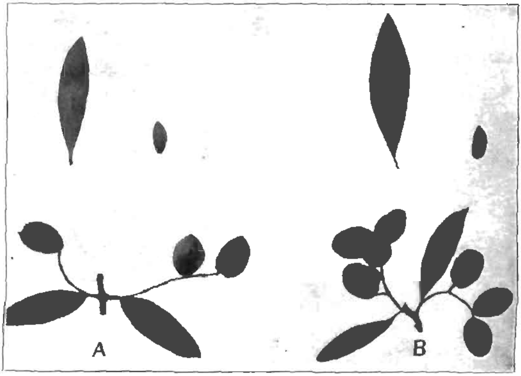


Fig. 27.—A. Olea Papillata. B. Olea Rubra.

into bearing early; is fairly good bearer, and produces a good quality oil but only in low to medium quantities; unsuitable for pickles. (Fig. 27.)

Papillata.—Tree of medium size, with straight branches; its leaves are short, broad, and far apart, being dark-green above and whitish underneath, a free bloomer but not a heavy cropper. The fruit is black, roundish oval, ending with a small topnot; strongly adhesive to pedicels, which are long. The oil is sweet and good, but only produced in small quantities; unsuitable for pickles. (Fig. 27.)

Laurifolia.—Fairly strong growing tree with very distinctive foliage. Large, broad, oval, lanceolar, dark-green, leaves borne on strong petioles. Blossoms borne in bunches. The fruit is roundish oval ending with a short blunt point, the skin is hard, dark, and the stone of medium size.

The oil is sweet and bland, but not abundant. Unsuitable for pickles. Only very moderate bearer.

Oblonga.—A good grower and cropper. The fruit is of oblong shape, narrow at the base and fuller towards the apex, giving a somewhat club-like appearance. The fruit is of good size with fairly large stone pointed at each end, and is borne on long pedicels to which they hang well. Its pulp is thin and oil bland and limpid. Of little value for oil or pickles. (Fig. 28.)

Conditiva.—Tree fairly good grower, with somewhat drooping foliage. The leaves are very long, close banded, and often curved. A profuse bloomer but poor cropper. The blooms often sterile. The fruit is large, oval, elongated, fleshy, with free stone, beautifully black when ripe, leaving its pedicel easily. The pulp is thick, tender, containing a sweetish oil in fair quantities for a pickling olive. This olive makes a splendid pickle, especially ripe, but owing to its shy

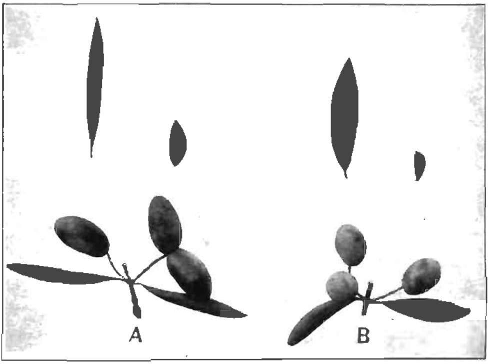


Fig. 28.—A. Olea Conditiva. B. Olea Oblonga.

bearing habits would probably not be a good commercial proposition; may do better with irrigation. (Fig. 28.)

Regalis.—Tree rather poor grower, fairly regular but light cropper, liable to scale. Fruit large, oval, generally borne singly at terminals or towards the base of last season's growth; deep bluish-black when fully ripe, changes quickly in colour. Unsuitable for oil, but makes an attractive green pickle but coarse in quality. (Fig. 29.)

Uvaria.—A good grower and free cropper. The fruit is of medium size, oblong oval, gets black when fully ripe, borne in bunches or clusters, as many as ten to fifteen fruits often being formed in a bunch. Ripens evenly and hangs well. Not a heavy oil yielder or high class pickler. (Fig. 26.)

Polymorpha.—Strong grower, of robust constitution, with distinct weeping habit. Moderate bearer tending to crop in alternate years. The fruit is oblong and very variable in size and colour. Generally of medium size, but running to large when the trees are in great vigor. The color of the fruit when ripe varies on some trees from green to violet-black, ripens rather irregularly. Oil good in quality, somewhat acrid in its youth, but keeping well, only produced in small quantities. Unsuitable for growing as a pickler, owing to variability in size. (Fig. 26.)

Nigerrima.—Appears to be a hardy, vigorous growing tree. Fruit ripens early, medium size, oblong, deep black when ripe; pulp is very black and bitter; makes a good oil that keeps well. Low in oil content and unsuitable for pickles; not recommended. (Fig. 29.)

Atro-violacea.—Fairly large and vigorous tree. The leaves are of a pale-green, small, elliptical, sharp, far apart and strong. The fruit is

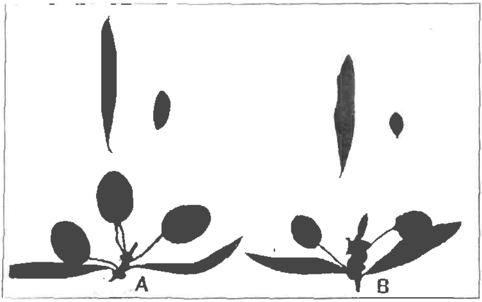


Fig. 29.—A. Olea Regalis. B. Olea Nigerrima.

borne on long peduncles, barely medium size, roundish oval, bluish-black when ripe. Makes fairly good oil, but not in large enough quantities to warrant planting; also unsuitable for pickling.

Buxifolia.—The box-leaved olive; an unimproved kind of no commercial value for oil or pickles. Like Laurifolia, believed to be a sub-species of O. Europaea, suitable for small hedges.

Further consideration of the various kinds in cultivation here has been held over for subsequent issue. The next number will not only contain notes respecting a lot of inferior kinds, but will embrace a selection of the best kinds known to cultivation in Europe, America, and this country.

(*To be continued.*)

THE CARE OF MILK AND CREAM.

By Alexander Moss, Dairy Supervisor.

The question of unclean milk and cream has probably been discussed more frequently than any other subject affecting the dairying industry, not only in this State, but in every other country in the world.

Unfortunately, under the present system, cream is being accepted at butter factories and paid for at the same price irrespective of its class or quality, with the exception of the very worst lots, which are rejected. When all grades are mixed together it has the effect of reducing the whole lot to an inferior standard of quality, so that it is impossible in the manufactured article to get the full benefit of the best supplies brought to the factory: and farmers who take special care of their cream do not reap the benefit of the care they take, but have to share equally the loss brought about by their less careful neighbours.

With regard to milk, very often sediment will be found in the bottom of the milk jug. This is an indication of gross carelessness somewhere between the cow and the consumer. Freedom from visible dirt does not mean that milk is necessarily clean, but the presence of sediment means that not only was dirt allowed to fall into the milk, but not sufficient care was taken to strain it out.

The most essential things in insuring a clean milk and cream supply are fortunately simple precautions, which do not in the long run add to the cost of production in any appreciable degree. I should say these may be pretty well covered by the following:—

A clean cow-shed, with an impervious floor and a good drain to carry the drainage well away, well lighted and ventilated, and frequently lime-washed. The cows' udders should be cleansed before milking, and the milker's hands washed before milking each cow, in clean water; the same water should not be used over and over again, and contained in a small fish-tin, as is sometimes observed. If the same water is used right throughout in a herd of forty cows, more dirt may be added to the cows' udders before the last cows are milked than would appear to be washed off. The best way is to use running water from a tap fixed in a kerosene tin, oil drum, or an unused milk vat of a separator set up in a convenient place in the shed. By this means the water is only used once, and you get a clean supply every time. No person should smoke, chew tobacco, or spit while engaged in the cowshed or dairy. Cream should be kept cool, well stirred, and covered from dust and flies, and not mixed with other cream until it is cooled down. The separator should be taken to pieces and washed every time it is used, any holes in the dairy utensils should be soldered, and not filled with soap or rags. Do not put cream or milk into rusty cans. Cans should be re-tinned or new bottoms put in them if they are worth it; if not, they should be discarded. If cream is kept in rusty cans it develops a metallic flavour; it may take up iron from exposed bolt heads or other metal parts of pasteurizers or rusty cream vats, in sufficient quantities to affect the flavour of the butter. The manufacture of good butter rests mainly with the suppliers, and they should do everything possible to deliver their cream in a good

and wholesome condition. Milk drawn by milking machines often has a peculiar flavour and contains a large number of undesirable germs. One of the important sources of germ content in milk drawn by machines is the condition of the rubber tubes and teat cups. The trouble from this source can be lessened: when the rubber begins to crack, new parts should be secured. Old overheated and cracked rubber is sticky, and when in use the rubber spreads and allows the milk to enter the openings; these crevices are difficult to clean properly, and are a dangerous source of infection. Another source of infection is the constant suction of the cowshed air in badly ventilated sheds through the pulsators into the buckets; this difficulty may be partially overcome, providing that the air is kept free from dust as far as possible.

Occasionally tests will vary at the factory. Suppliers should not decide they are being defrauded in any way when their test varies. Some reasons for variation in tests are changes in the speed of separator bowl, changes in the temperature of the milk, changes in lactation period of the cow.

BARLEY TESTS.

Experimental Plots at Wortham.

A meeting of farmers was held on Wednesday morning under the auspices of the East Suffolk Education Committee to inspect a barley variety experiment which is being conducted on the farm of Mr. H. L. Newstead, of New Water, Wortham. Mr. A. W. Oldershaw, agricultural organizer to the Committee, demonstrated the points of interest.

He pointed out that last year barley variety tests were carried out at four centres in the county, and that on the average of these centres Beavers Plumage-Archer had given barley valued at £8 19s. 6d. per acre: Hunter's Archer, £8 18s. 4d.; Princess, £8 16s. 10d.; Goldthorpe, £8 16s. 3d.; Beaver's Archer, £8 13s 7d.; and Page's Chevallier, £7 13s. The outstanding feature of the experiments was the fact that Chevallier gave about £1 per acre less money value than any of the other varieties tested. The difference between the other varieties in money value per acre was not great.

At Mr. Newstead's the following varieties were being tested:—Irish Archer, Princess, Beaver's Archer, Beaver's Plumage-Archer, Irish Goldthorpe, Webb's Burton Malting, Chilian Chevallier, and Kinver Chevallier.

Of these varieties the first four were those included in the test last year, the first three being pure strains of Archer from different sources. Beaver's Plumage-Archer was a cross between Plumage, a wide-eared barley of the Goldthorpe type, and Archer. Burton Malting was a wide-eared barley brought out by Webb's. It was somewhat similar to Goldthorpe, but rather earlier. It was very much grown in the Midlands, but not much in the eastern counties. Chilian Chevallier had been grown successfully near Ipswich for the last year or two, hence it had been thought desirable to include it in the test, while Kinver Chevallier might be regarded as a typical pure Chevallier.—[*Journal of Milling*, 5th August, 1914.]

THE PEANUT.

(Arachis hypogæa, Linn.)

By P. J. Carmody, Chief Orchard Supervisor.

Since the few instances in which the peanut, or ground nut, has been tried in Victoria have satisfactorily demonstrated that it can be successfully produced, keen interest in its potentialities as a commercial proposition has been evoked amongst the irrigators of small holdings in the northern part of the State.

With the view of familiarizing prospective farmers of this crop to its habits and characteristics this article is written.

The peanut is an annual herbaceous plant growing from 1 to 3 feet in height, according to the variety, and to the fertility of the soil in which it is cultivated. In general appearance it resembles clover, but four leaflets occur in each leaf instead of three, as is the case with clover.

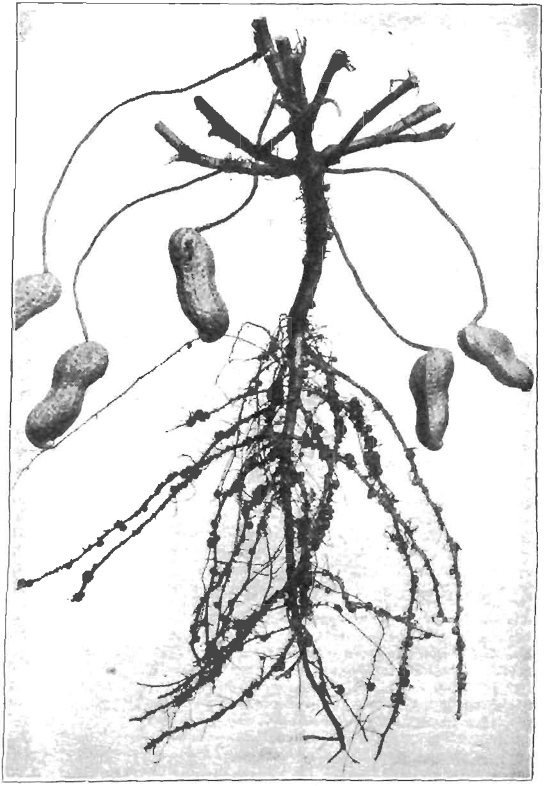
The flowers are bright yellow and are of two kinds, male (staminate) flowers, and female (pistillate) flowers more or less hidden in the axils. The more conspicuous male flowers are sterile and soon die. The female flowers when first produced are sessile, but after fertilization has taken place the peduncle is developed, and curving downwards penetrates the soil and buries the fertilized ovary beneath where it develops its seed, and the familiar peanut of commerce is formed. If the stalk fails to penetrate the soil no seeds are produced, so that in soil destined for the cultivation of the peanut a fine tilth is necessary to enable the delicate flower stalk to penetrate it.

The peanut is believed to have originated in Brazil, where several other closely allied species are found. It has now a very wide field of cultivation in tropical, sub-tropical, and temperate regions. Climates favorable to the production of citrus fruits and maize are considered suitable to the peanut. So popular and important has this nut become that in many countries thousands of acres are devoted to its cultivation Virginia and the Carolinas produce the largest quantities in America, but it is extensively grown in many of the other States. It is also largely grown in Africa, Brazil, Argentine, India, Japan, and Java. Spain and Sicily are the great nut producing countries of Europe. In Northern Australia good crops of this ground-nut have been harvested, and there is no reason why, when our irrigation farmers become familiar with its cultivation, it should not enter into our system of rotating crops.

Varieties.

There are only a few varieties of peanuts in general cultivation. By the selection of good, sound seed from vigorous and heavily yielding plants, farmers interested in this particular phase of agriculture will be able to supply themselves with seed suitable to their climate and soil.

The Spanish peanut is regarded as one of the heaviest producers. The plant is of the bunch type and somewhat upright in habit, bearing



Roots of Peanut Vine, showing the value of this plant as a nitrogen gatherer. The nodules on the roots are formed by the bacteria which collect the nitrogen.

its pods clustered around the base. The foliage is heavy and abundant. Two seeds occur in each pod and are very rich in oil content. Pods stick well to plant when digging.

The Virginia nuts vary from a moderate to an immense size. The vine has two habits—a trailing and a compact upright one. In the former the pods are produced along the stem, while in the latter they are formed near the base. The pods of this variety are bright and clean and cling well to the stem during harvest operations.

African or North Carolina is a rank grower, with dark green massive foliage, and is grown for oil in Africa. It has the habit of the Virginia trailer.

Tennesse Red resembles the Spanish, but owing to its colour is grown chiefly for fodder.

Valencia is similar in many respects to Tennessee Red, but of much better quality and takes about four months to mature.

SOILS.

From the fact that the plant buries its pods in order to develop them, it is evident that the soil must be in a suitable condition for their reception. Consequently sandy loams are regarded as best adapted to the cultivation of the peanut. If it is intended to offer the nuts on the market for edible purposes, a soil of a light colour is to be preferred, as there is a considerable risk to the discoloration of the fruit if grown in dark soil impregnated with iron.

Under careful management goods crops have been produced in the heavier soils, but they were reserved for stock, owing to the unattractive appearance of the nuts.

The sandy pine ridges that frequently occur in the irrigated areas of the north offer splendid accommodation for a crop of this kind. Care should be taken, however, to avoid those soils that set after irrigation. In the young orchards, advantage could be taken of utilizing the spare ground between the rows of trees to grow peanuts where the soil is of the character indicated above. Owing to the presence of nitrifying bacteria on the roots, nitrogen is added to the soil by the peanut, as in the case of peas, tares, and other leguminous plants.

PREPARATION.

The land should be ploughed moderately deep, from 7 inches to 8 inches, and reduced to a fine tilth. Ridges 3 feet apart from centre to centre are formed by two reverse furrows in the same way as the "crown" of the land is made in ordinary ploughing. By attaching a board to the back teeth of a Planet Jr. cultivator the ridges can be levelled down to the required height, about 3 inches. If the ground is weedy or covered with grass the ploughing should be done in the Autumn and left till Spring, when, by means of disc harrows and cultivators, it can be thoroughly worked up into a fine tilth preparatory to forming the ridges.

FERTILIZERS.

The amount of fertilizers to be used will, of course, depend on the natural fertility of the soil. If too large a quantity is used the plants will produce too much haulm and very little fruit. For the same reason

fresh stable manure is to be avoided. The peanut enjoys a soil rich in lime, and if this is deficient, from 5 to 10 cwt. of fresh burnt lime per acre should be applied in the Autumn, the heavier dressing in soil over-run with weeds. If the farmer considers fertilizers necessary, an application of 100 lbs. of superphosphates, 150 lbs. of dried blood, and about 50 lbs. of muriate of potash per acre would be found beneficial.

The practice adopted in countries where the peanut is grown is to distribute the fertilizers in the narrow strips where the rows of plants are to be sown and thoroughly mix with the soil before forming the ridges in which the seeds are sown.

PLANTING.

If the seeds are planted out whole, germination is delayed, as the shells or husks must decay before the young plants are allowed to escape. In such a climate as ours this takes a considerable time, so that it is better to plant out decorticated seeds.

The shells are carefully broken by hand so as not to injure the thin brown skin that coats the seeds. Injury to this part is liable to be followed by decay after planting. A great advantage in sowing the decorticated nuts is the opportunity that is offered for the elimination of all defective seeds, and selecting only the full plump ones, whereby a better "stand" is secured. The seeds should not be shelled until a short time before they are required to be used as their power of germination is likely to be weakened.

By means of an improvised harrow with teeth set at the required intervals, 36 inches, the drill for the seed can be marked out along the centres of the ridges already formed, and the seeds dropped in by hand at spaces of not more than 12 inches, at the same time covering them up with the feet. From 1 inch to 2 inches is the depth at which the seed is sown. In the heavier soil, about 1 inch is sufficient.

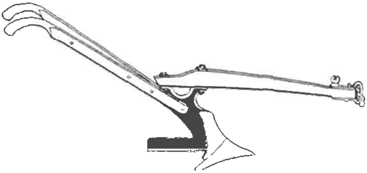
The time of planting varies with the climate. In temperate regions the peanut takes about six months to mature its crop. About the beginning of October, when all risks from frosts have disappeared, the nuts can be sown. This will give sufficient time for the maturing of the crop before the harvest in the autumn.

After the young plants have reached a height of a couple of inches the cultivator should be run up between the rows. Opportunity for irrigation is afforded by running the water along the depressions between the ridges. In order to conserve moisture and suppress weeds, it will be necessary to frequently use the cultivator, particularly after each irrigation. The surface must not be allowed to "set." It is important during cultivation not to injure or disturb the first-formed nuts near the base of the plants. Cultivation is unnecessary after the plants have made sufficient growth, and when this takes place the soil should be gathered well into the plants to offer facility for the fertilized ovaries to penetrate it.

HARVESTING.

As frosts are injurious to peanut vines in all stages of their growth, it will be necessary, if required for fodder, to begin harvest operations before their advent in Autumn. The time when the nuts should be dug must be left to the judgment and experience of the grower.

Generally, however, as soon as the crop of nuts is developed on the bush, and when the stems assume a yellow appearance, an ordinary plough, with the mouldboard removed, is run along the rows. By this means the plants are loosened, and are then gathered, the sand shaken out of them, and thrown into small heaps.



Plough Type of Peanut Digger.

If the area under cultivation is limited, the plants can be forked out and similarly treated. In countries where this industry is extensively carried on, special machinery is used for carrying out these operations.

Stakes Around which Stacks of Peanut Vines are to be Built.

After the vines are allowed to remain in the heaps for three or four hours, they are gathered in stacks around central stakes to cure. If they are exposed for an undue length, they lose in weight, and become more or less discoloured, and their market value greatly depreciated. As the haulms or stems of the vines are of a sappy nature, they take

a long time to cure, and are liable to mildew if stacked in large heaps where there is difficulty in properly drying them.

Small stacks or shocks are built around a stake 7 or 8 feet long set firmly in the ground. The stakes should be sharpened at both ends, and a couple of pieces of laths about 18 inches in length nailed at right angles to the stake, about 6 inches from the ground, to prevent the vines coming into contact with the wet soil. The stack is then built in successive layers with the nuts to the centre and the stems sloping outwards to shed water. At times, a few vines are hung round the stake to tie the stack together. When approaching the top, the stack is rapidly "drawn in" so as to form a cone capping.

These stacks afford a large surface to the winds, so that the curing is effected more readily than in larger stacks.

Peanuts are picked from the vines when the pods become dry and the seeds firm. It usually requires three to four weeks in the stack before the pods are ready to be picked. Rapid curing causes the seeds to shrivel. From the time the plants are dug they should not be exposed, and the stacks should not be opened during heavy dews or rain, as the nuts are liable to discolouration.

The peanuts, if required for edible purposes, are picked from the vines by hand, though machinery is now largely used to do this work. After picking they should be kept in a well-ventilated building, and not allowed to come in contact with any dampness. In countries where this industry is extensive, the factory cleans, blanches, and grades the peanuts for market.

USES.

Peanuts have a wide range of utility. Every one is familiar with the edible nut, as offered for sale in the streets, shops, and many places of amusement. They are also extensively used in confectionery, in the manufacture of peanut butter, peanut meal, and peanut oil. The peanut oil is used for the same purposes as olive oil, though slightly inferior. The peanuts, when grown for fodder, are generally fed to pigs, which are turned in on the crops to root out the nuts for themselves after the tops have been cut for hay. A crop of 60 bushels of peanuts per acre is considered a good yield, and the price per bushel varies from 2s. 8d. to 3s. 4d. in America, so that the returns at these prices would be, apart from the hay, £8 to £10 per acre.

FORESTRY IN AUSTRALIA.*

A SKETCH.

By H. R. Mackay, Conservator of Forests, Victoria.

Part I.

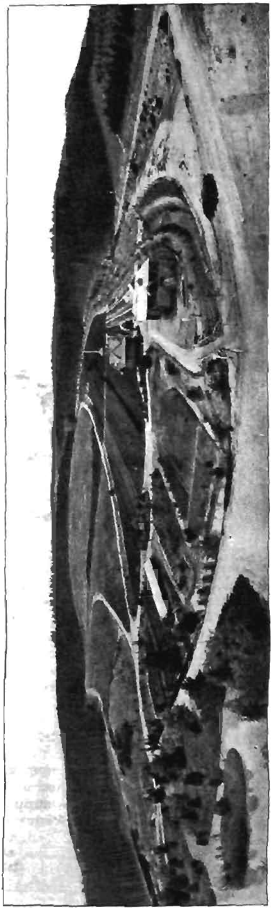
Of all the great divisions of the globe, Australia has the smallest area of timber-forest in proportion to her total land surface. The figures on this subject given in most publications are very misleading, being merely rough estimates, which do not distinguish between true forest land, bearing timber of commercial value, and other large areas irregularly wooded or bearing dwarf eucalypts, and various forms of acacia, such as mulga, myall, &c., together with the stunted cypress pine and casuarinas of the interior. Some statistics give the forest area at over 100,000,000 acres, or about 5 per cent. of the total land surface, an excessive estimate when I point out to you that the forest area, as well as the forest wealth of each State, has never yet been based on trial surveys or fairly accurate data, and that the irregular course of settlement, with the widespread damage which occurs in all Australian forests from the regularly recurring summer fires, materially reduces the total acreage every year. After an examination of all available authorities, I have come to the conclusion that the true forest area is less than 4 per cent., or under one twenty-fifth, of the total land area. Further, the forests are almost entirely coastal, that is to say, the magnificent hardwoods, of which they chiefly consist, are confined to a great belt, with long irregular breaks at intervals, which extends from 100 to 150 miles in width, and which generally follows the coastal line. On the inland side of this narrow watershed and wooded belt, the forest growth rapidly deteriorates as you advance towards the centre, box of medium growth alternating with cypress pines and casuarinas, till at last, in the central depressions, clumps of stunted eucalypts exist, which are intermixed with acacias and other forms of scrub growth.†

It has taken the Americans some 250 years, reckoning from the period when the eastern States began to be fairly settled to bring their great forests of hardwood and pine to the verge of destruction. But Australians, with the experience of the world before them, have taken only about 70 years to bring their forests to the same condition of partial ruin. And the reason of this is plain. Australia has no great central range of mountains, with long water-ways draining their slopes and valleys, forming an extensive forested region such as the water-sheds of the Missouri and Mississippi, or the broad stretches of pine and spruce-clad country which surround the Great Lakes to the northward. Her central plains and plateaus are almost treeless, and thus, as population extends, there is no great wooded territory in reserve to meet the requirements of her people for timber supply. No steps were taken

* Address delivered at the Annual Conference of the Australian Natives' Association, 13th March, 1913.

† The chief timber producing countries of the world have the following percentage of territory under forest :—Sweden, 52·2; Russia, 43; Germany, 25·9; Austria Hungary, 29·6; France, 15·6; United States, 33·6; Canada, 22·3.

in the early history of these States to delimit and set aside by law the best areas of *natural forest*, and, as settlement proceeded, once the fertile lands of the plains became occupied and gradually passed to private ownership, new settlers in search of land invaded the mountain ranges. It was in this way that the great Otway and Strezlecki forests of Victoria were virtually destroyed in the course of about 30 years, scarcely any timber growth of value being left even on the highest ridges and pinnacles, while on the broader plateaus, where the eucalypts grew to giant size, and the blackwood equalled in height and girth the common hardwoods of the lowlands, the same wide destruction prevailed. And now be it remembered, that the plea that this kind of land was fit and necessary for settlement could not be truthfully advanced in many instances. After high mountain forests and tablelands were thus occupied in small holdings and stripped of their cover, it was found that, owing to the heavy cost of clearing and the unfitness of the soil for cultivation, men could not support families on the land with comfort, but had to have recourse to timber-cutting or other work as wage-earners. Hence, it was found necessary later on to repurchase in the plains and river valleys land at substantial prices really fit for families to make homes on. This course of settlement, with temporary clearings in the heart of thick forest, has been more marked in Victoria, perhaps, than elsewhere, and in many districts of high elevation one



View of State Nurseries, Creswick, Victoria.

now witnesses the temporary clearings abandoned by the original settlers being gradually invaded by a new forest growth, the selectors having departed to make a start elsewhere on lands which give more prospect of success

Let us now take the several States in order, glancing briefly at their forest reserves and resources. Queensland, whose main forest area, much over-estimated at 40,000,000 acres, lies between the coast range and the ocean, has under 3,750,000 acres set aside for timber supply, but no portion of this is inalienable by law. Her hardwood timbers, consisting chiefly of ironbark, tallow wood, spotted gum, blackbutt, bloodwood, and turpentine, are of great value, but limited in extent. To these we may add first-class timbers for the cabinetmaker, such as cedar, silkyoak, maple, blackbean, yellowwood, and, in a less degree, kauri, hoop, and bunya pine, which, owing to the inroads of settlement,

Another View of Creswick Nurseries.

have greatly dwindled in quantity. It is admitted in the latest available report that the forest reserves of this State are not under safe tenure, that much waste occurs in the extraction of timber, and that but little has yet been effected to put the forests on a safe working basis, in order to insure a regular timber supply. Meanwhile, large quantities are being cut by mills for the home market, and for export, and unless public opinion supports the management and gives greater powers of control to insure proper working, it is plain that the capital value of the extensive supplies still to be drawn upon will be very much impaired. The revenue received by this State in 1912 from sales of timber was £53,000. Under £3,000 in the same year was expended on a forestry staff, and the bulk of the work was done by agents and rangers of the Lands Department. Nothing was spent on forest improvement work or new plantations.

New South Wales, with a forest area estimated at some 15,000,000 acres, about 7,500,000 acres of which are provisionally reserved, originally possessed in her coastal forests some of the most valuable hardwoods of the Continent, the species being similar to those just mentioned as growing in Queensland, with other kinds which are common to Monaro and Eastern Victoria. The spread of settlement between the coast range and the ocean, however, has greatly depleted her areas of good natural forest. Tallowwood, for instance, has become exceedingly scarce, and the best supplies of mature ironbark have gradually disappeared, till in some districts the State railways have to take secondary and inferior timbers for bridge-work and sleepers, whilst an embargo has been placed on the export of this matchless hardwood. On the northern rivers, silky oak and cedar have virtually disappeared

Packing Young Trees at Creswick Nurseries for Despatch to Various State Plantations.

from extensive areas, and the supplies of Moreton-bay or hoop pine—a very useful softwood for the cabinetmaker and joiner—are also much depleted, being confined to coastal areas near the Queensland border. The State has still fair supplies of redgum along the course of the Murray, but, owing to its situation, this fine timber chiefly finds a market in Victoria, being too distant from Sydney for transport by rail. In 1912, New South Wales exported timber, chiefly railway sleepers, beams and bridge and jetty material to the value of £280,000, while she imported timber, chiefly pine and spruce, to the value of £1,147,000 These figures, I understand, include considerable supplies for the silver mines of Broken Hill, where oregon is largely employed. Her Forests Department has just begun to establish plantations of softwood, and, in view of the position just stated, heavy and costly work lies ahead of

it, not only in this direction, but in the improvement and restocking of the great hardwood forests. The revenue of New South Wales from sales of timber, in 1912, was over £95,000. Of the expenditure (£34,000) in the same year, nearly £30,000 was spent in salaries and wages, and only £3,900 on improvement work and plantations.

Victoria, being the centre of the mountain system, is, in proportion to her small territory, one of the best wooded of all the States, but

Forest Scene, Rubicon Reserve, Alexandra District (Blackbutt and Mountain Gum).

her area of timber-forest is much lower than the figures commonly given, namely, 11,800,000 acres. It may now be accepted that the true area is less than 7,000,000 acres, and a proportion of this at high elevations has been greatly damaged by fire. As we cannot safely encourage an export trade in the more durable hardwoods, such as redgum, box, and ironbark, the moderate supplies of these timbers still available are reserved for the requirements of our railways and public works generally,

but it is significant that the price of railway sleepers of these timbers is somewhat lower in Melbourne than in Sydney, while the cost of the less durable jarrah supplied from Western Australian forests to South Australia is considerably higher at Adelaide. As regards timbers fit for building construction, coach-building work, and plain furniture, we have still large supplies untouched standing in virgin forest. These areas require only protection from fire and careful working and management to reproduce themselves indefinitely. Such timbers, when seasoned for flooring, plain cabinet-work, and joinery, will, I consider, be available shortly for sale in large quantities, as private firms, being satisfied of their fitness for the purpose, are about to take up the industry on an extensive scale. As regards plantations of pine and fir, the areas devoted to this purpose are being extended every year, and will soon reach 20,000 acres, but such an area is not a tenth part of what should be maintained by Victoria under pine-forest for our own needs, seeing that we purchase from foreign countries timber of the kind to the value of about three-quarters of a million sterling. The revenue from the Victorian forests is, roughly, £50,000 a year. Of this sum, about £15,000 a year only is expended in new plantations and forest improvement.

Tasmania has over 65 per cent. of her territory, or, in other words, about 11,000,000 acres, under forest. Much of it consists of excellent hardwoods similar to those of Victoria, namely, stringybark or messmate, bluegum, mountain ash, silvertop, and cidergum. In addition, she has limited supplies of fine coniferous or softwood timber, such as huon pine, celerytop, and King William pine. Lastly, she has fairly extensive belts of blackwood—one of the finest furniture or cabinet timbers which the world possesess. Her reserves, the tenure of which is merely nominal, are set down at 1,000,000 acres, but, owing to her small population and her large proportion of forest land, it is plain that some of the Australian States on the mainland will have to draw upon her for supplies as their own resources become reduced. At present she has no system of forest conservation or control, but a Committee has lately been appointed to frame a Bill for the reservation and protection of the forests as a first step to stricter methods of working.

South Australia has a very small area of natural forest, which is situated chiefly in the south-east part of the State, close to Adelaide and Spencer Gulf. Her total wooded area is set down at something under 4,000,000 acres, but most of this does not represent timber-forest. Her reserves embrace less than 147,000 acres. Her treeless condition made early planting a public necessity. She has pursued the establishment of plantations of hardwood and pine with great energy for over twenty years, and to-day the Government has within its enclosures some 16,000 acres, chiefly of eucalypts and pine. A fair proportion of the timber growing in these plantations is now approaching a size at which it can be put to commercial use.

Western Australia, with a forest area bearing all kinds of timber, roughly estimated at 20,000,000 acres, very little of which is, however, protected by permanent reservation, is to-day subject to the most extensive timber-cutting operations of any of the States of this group. Last year she exported timber to the value of nearly a million sterling (6,000 men being at work as timber-cutters in the forests), for which the

Government received a nominal revenue of less than £45,000. Practically nothing was spent in the improvement of the young coastal forests, and nothing in preparing cut-over areas generally for safe natural reproduction. The Government expended in salaries and wages £10,470, and then apparently left the maintenance of the forest to chance or the next generation. From a table published with the last Perth report, I find that the State has derived from the forests (the fees and royalties for a long period being merely nominal), during the eighteen years from 1895 to 1912, no less than £380,000. Here, again, is a State which chooses to neglect the elements of conservation and management in order to maintain a large export trade in timber, which some local authorities aver cannot last beyond twelve to fifteen years.

In concluding this rapid sketch of Australian forests, a dispassionate *survey of their present condition generally must lead us to the opinion*

Forest Scene, Orbost District, East Gippsland.

that all the States have for many years past neglected the simple elements of proper management and control, and that, when not *engaged in wastefully alienating tracts of valuable hardwood, which* should remain national property for all time, they have been busy in overtaxing the safe timber yield of their reserves in order to foster an extravagantly wasteful export trade. This trade is encouraged at times even at the expense of the States' own public and private requirements, while the measures taken, and the public funds devoted to the preservation and improvement of the most valuable forests of the country, are absurdly inadequate to the purpose. It follows, also, that while Australia imports annually enormous quantities of softwood for building construction, and while nearly every State has extensive areas of waste land, the soil and climatic conditions of which are admirably suited to the growth of spruce and pine, they have nothing but a few puny

plantations of such trees to set in the balance against the waste of three generations. Apparently, for some years to come, Australia will be content to deal with small measures, such as the elaboration of all that relates to the franchise and the voting machine,. and will continue to neglect the duty of protecting and developing her great natural forests, on whose existence depends the prosperity of so many useful industries.

Denuded Areas, Strezlecki Range, South Gippsland. This shows destruction of timber.

PART II.

I now come to the second part of my subject—the mountain watersheds of Victoria:—

With the exception of the Grampians, Mt. Cole, Wombat Ranges, the Upper Yarra Ranges, with part of Baw Baw, Mt. Buller Range, and

a portion of the Omeo Ranges, but little of the mountain chain of Victoria, which forms the Main Divide, is reserved under any form of tenure, and thus protected from alienation, or from the dangerous and insidious form of occupation which arises from grazing licences, with indiscriminate firing during the hottest season of the year. Virtually, the whole of these unreserved mountain ranges, embracing within their limits several hundred thousand acres, bear forests of great value considered merely as a source of future timber supply, but considered in their climatic aspect as the storehouses of our heaviest snowfall and rainfall, as the sources of springs, and the regulators of our stream flow, their value to the people of this country is priceless. Viewed as timber forests alone, they bear enormous quantities of ash, woollybutt, bluegum, spottedgum, stringybark, messmate, silvertop, and peppermint, *ranging in value from £50 to over £100 an acre*, but above a certain line of elevation, they must always be strictly protected from the axe of the timber-getter, as well as from the ravages of fire.

Settler's Home, showing lack of shelter for homestead.

Therefore, if they are not to be allowed to disappear during this generation, they must be put under the strictest form of reservation we possess, that is, under forest law, and further be patrolled and guarded during the dangerous season of hot winds by an active body of guards, who will check and prevent the incendiary fires which now threaten their very existence every summer. At present the Forests Department is able to spend about £500 a year only in forest fire protection, but fully six times this sum is essential to safeguard the principal mountain forests from deliberate fire-raising. It must be remembered that, not only are our young forests of evergreens very inflammable in summer, owing to the essential oil in their foliage, but that many of them bear a dry fibrous coating of bark which carries fire to the summit of the loftiest stems, while the underwood and scrub, after a few hours of hot winds, is in a condition to carry forward volumes of flame of a fierceness and intensity which cannot be successfully coped with by even

a large body of fireguards. An army of beaters is helpless in thick forest with heavy undergrowth, when such fires have made headway with a raging wind on a wild January day, for not only the main fire cannot be approached, but strips of flaming bark are carried ahead long distances, lighting up new walls of fire, perhaps nearly half-a-mile from the break or track where the beaters are at work. Therefore, the first essential for the safety of such forests is to prevent, as far as possible, the outbreak of any dangerous fires.

A short time ago I had occasion to examine the high country which forms the Divide between the head waters of the Goulburn and Mitchell on the south, and the King, Buffalo, Buckland, and Ovens Rivers on the north. For several days we travelled along high, narrow ridges which had originally been clothed with thick belts of woollybutt and

Farmer's Wood Lot, showing provision for fencing and fuel, Western Plains, Skipton.

ash. Now, the timber on whole ridges and spurs was completely destroyed. Gaunt bleached skeletons of dead trees stretched as far as the eye could reach, falling southward toward Gippsland, and northward towards the Murray. Where patches of deep granite soil existed in folds of the tableland, and belts of young seedlings had given promise of a new forest, a second fire had swept over portions of the range and had destroyed them. In many places, useless scrub acacias, and patches of high bracken in the upper valleys, had taken the place of young tree-growth. On the bare slopes, where, in spring, soakages existed, the shallow peaty soil had been burnt away, exposing many acres of naked rock, while, in the steeper valleys, erosion from the winter rains and the snow water of spring had set in, the narrow water-courses gradually widening into a gulch or ravine whose course could be traced

into the lower valleys far below. What I witnessed in those fire-swept areas, I have seen in many other parts of the Australian Alps and again in Central and Southern Gippsland, as well as in the soft grey sandstone of Otway, and the Strezlecki Range. Probably, there are few places in Australia where the neglect and utter disregard of the protective influence of mountain forests is so marked as in Eastern Victoria. Everything appears to be sacrificed to indiscriminate selection, or private grazing rights, and where the occupier cannot hope to *ringbark a grazing block* in *mountain* country, he attains his aim in a speedier way by the use of match and fire-stick. How long, we may well ask, is this callous indifference to the safety of our timber supply, our water supply, and the soil of our mountain slopes and valleys to last? For the sake of a few hundred pounds, paid yearly for the right to enjoy unrestricted summer grazing, we are imperilling the existence of many of our best forests, impoverishing the soil of extensive areas of hill and valley, and gradually bringing about the silting up of perennial streams and river beds.

Worst of all, in a land subject to periodical droughts, we are endangering, in many instances, the regularity and volume of our stream flow. The State has spent several millions sterling on storage works and irrigation basins on the plains. On the continued storage capacity of these basins and reservoirs generally, the prosperity of our richest orchard and farm lands depends. Are we prepared to knowingly *sacrifice the prosperity of great stretches* of our northern plains to the temporary interests of a few score stock-owners, who should be excluded altogether from country which apparently they cannot occupy without bringing about its gradual ruin?

TEMPERATURES FOR MATURING CHEDDAR CHEESE.

By R. T. Archer, Senior Dairy Inspector.

The temperature at which the cheese maturing room is maintained is of the greatest importance, as the flavour developed is largely dependent thereon. Greater provision is required in most of our factories for the control of the temperature, as frequently good cheese is ruined in flavour by being subjected to too high temperature. In addition, there is loss of weight from excessive evaporation of moisture and loss of fat.

The cheese industry in this country is only in process of development, and the system now almost universally adopted is a Canadian modification of the old English Cheddar process. The Canadians have given the subject great study, and most nearly approached the best English makes in quality. One thing that has aided materially in this direction is the greater attention paid to the temperature at which the cheese is matured. The man most responsible for this is Mr. J. A. Ruddick, Dairy and Cold Storage Commissioner of Canada. It was

found that the maturing rooms in England where the best cheese was made never went above 65 degrees Fahrenheit, and the best quality of Canadian was always produced during the months of September, and possibly October, simply because climatic conditions at that time of the year give better maturing temperatures than at any other season. After careful investigation it was decided that 60 degrees was the temprature which gave the best results, and it was decided to demonstrate this on a commercial scale. In the spring of 1902 the Dairy Commissioner was authorized by the Government to build four large central cool curing rooms at convenient centres, to which the cheese from some forty factories could be conveniently conveyed every day. These establishments were operated for five seasons, handling in all 190,087 boxes of 80-lb. cheese. Two cheeses from each factory's make were set aside every week for the purpose of testing the savings in shrinkage and the effect of cool curing on the quality. These two cheeses were always selected from the same batch; one of each pair was kept in the cool room, and the other was kept in a room where the temperature was uncontrolled. Over 3,000 pairs were tested in this way, and they were all carefully examined and compared until they were several months old.

The results of this extensive demonstration is summarized as follows:—

1. Cool cured cheeses are invariably better in texture and flavour than cheeses from the same batch cured at ordinary summer temperatures.
2. The saving of shrinkage amounts to about 1½ per cent. during the first two weeks. It varies according to the moisture in the cheese.
3. The surfaces of the cheese should be allowed to dry thoroughly before the cheeses are placed in the cool room.
4. If cheeses are exposed to a high temperature for more than 24 hours after being taken from the press, there is a permanent injury which no subsequent cool curing or cold storage will remedy.
5. The central curing room plan adds very greatly to the cost of handling the cheese, and does not show any compensating advantages as against cool curing at the factory. The capital expenditure required to erect and equip a central curing room is about equal to the cost of improving the ordinary curing rooms of a group of factories which would be tributary to a central establishment.

To apply this to the individual factory or farm requires that the maturing room is properly insulated and the temperature controlled by artificial refrigeration, which is now within the reach of every cheesemaker.

THE HERB OF THE "SWEET POTATO" (IPOMOEA BATATAS, POIR) AS A FODDER FOR STOCK.

By G. Renner, Botanical Assistant.

In the *Bulletin of the Imperial Central Agricultural Experiment Station, Japan* (Vol. 2, No. 1, Tokio, March, 1914), Mr. T. Katayama invites attention to the value, apparently little known, of the stem and leaves, *i.e.*, the parts above ground, of the "Sweet Potato" as a nutritious fodder for stock. As this must be plentiful wherever the plant is at all extensively grown, and since the Sweet Potato has been cultivated, with some success, even in Victoria, it may be of some interest to become acquainted with the results of the Japanese scientist's experiments which led him to devote an article of upwards of forty pages to the praise, and to an account of the treatment, of the herb for the purpose of its employment as fodder. His compatriots, it appears, whilst assiduously cultivating the plant for the sake of its tubers, look upon the stem and leaves rather as a necessary evil, because of its rank growth soon covering the whole field from which it must be removed as "worthless ballast," or ploughed under, a troublesome task, too, on account of the long tough stems of the plant.

The Sweet Potato" (*Ipomœa Batatas*) is a member of the natural order of *Convolvulaceæ*, which, it may be incidentally mentioned, includes among others our "Bindweed," the pretty "Morning Glory," the redoubtable "Dodder," and about ten other genera indigenous to Australia. There seems to be some doubt as to the original home of this plant, some botanists believing it to be India, whilst Mueller in his *Select Plants* repatriates it in South America. It is certain that it was brought to Europe from Brazil, and that it is now naturalized in most tropical and some sub-tropical countries, where it is cultivated for the sake of its tubers, which are rich in starch, and furnish the so-called "Brazilian Arrowroot." Japan alone produces about 3,000,000 tons of "sweet" potatoes annually on 290,000 hectares (1 hectare = 2.471 acres), and for this purpose turns to good account large areas, especially of the smaller islands, which are unfit for rice-cultivation by reason of their mountainous nature.

The amount of starchy contents of the tubers, it is interesting to learn, increases with the latitude, according to Wiesner, that is to say, it is lowest in the tropics, rising to 15 per cent. in the cooler regions; as regards the percentage of sugar the contrary is the case. Of course, there is an irreducible minimum of annual temperature below which the "Sweet Potato" ceases to be productive, thus only northern portions of Victoria would be suitable for its cultivation. Inquiries, made at the Government Statist's Office as to the quantity still grown in Victoria, elicited the information that the amount is negligible. But, to return to the consideration of the feeding-value of the plant itself: Mr. Katayama estimates the quantity of green material, that is to say, the aggregate weight of stem and leaves, per hectare at 13 tons. To render such vast quantities a source of blessing rather than a nuisance, he instituted carefully conducted experiments in order to determine the exact feeding

value and dietetic effects of the herb, both in its green and in its dry states, on the animal's body and health, and the results lead him to believe that the fresh stems and leaves of the "Sweet Potato" are a rather "watery" fodder resembling in composition the leaves of the sugar-beet, containing tannin, however, instead of oxalic acid. They must, however, be given with caution, the best method being to mix them with an equal bulk of dry hay or straw in order to avoid possible drastic effects. He, himself, has not noticed any unpleasant results arising, even from the exclusive use of the green portions in the fresh state, and he specially mentions that, in some regions, milch cows and pigs are fed, for long periods, with large quantities of the fresh material with the best results. It is, however, the dried material with which he is specially concerned, and which he desires particularly to bring under the notice of the stock-owner.

He recommends that the green herb be gathered, preferably at the time when the tubers are harvested, and then be spread out to dry in the air. The time and space required for the purpose are the only objectionable features, to avoid which he suggests, as an alternative, siloing of the material. Of this more anon. In his experiments he spread the stems and leaves thinly on straw mats and succeeded, in fair weather, with an average day temperature of 13 to 19 centigrades (=55.4 to 66.2 Fahrenheit respectively) in obtaining within ten days a "straw" of fair consistency. (A quantity he caused to be dried by the aid of hot air in cylinders. This manner of exsiccation, however, not being of immediate practical value to the grower, will be left out of consideration in this paper.)

The air-dried herb has a fine "aroma," and is gladly eaten by stock with such gratifying results as led the experimenter to believe that its feeding-value equals that of dry hay of fair quality. It would be best to store it as soon as air-dry so as to avoid leaching and deterioration of the leaves.

Now, as to its lending itself well to preservation in the silo, Mr Katayama was able to prove by experiments, carried out as carefully as those with the air-dried material, that fine ensilage may be produced by filling the silo in the customary manner with the closely packed material, previously reduced, say, in a chaffcutter, to small pieces. The air is admitted as little as possible. Under such conditions he was able to obtain, in approximately five months, a pleasantly smelling and wholesome ensilage which was, with one exception, readily and even greedily eaten and well digested by the animals experimented with, and, even in the exceptional case the taste for it was soon acquired and the fodder thereafter well liked. The loss in nutritive material, suffered by the ensilage in the process of fermentation amounted only to about 6 per cent., a most satisfactory result. It is advisable to remove from the silo, for the purpose of feeding it to the animals, only just about the quantity required for immediate consumption, since it is not improved by keeping.

As all these results are the outcome of experiments conducted under conditions which admit of no doubt as to their scientific correctness, the settler in suitable districts may find it well worth his while to give the "Sweet Potato" a trial both as a producer of starch in the tubers, and as a provider of good and wholesome fodder in its green, that is to say, its above ground, portions.

STATISTICS.

RAINFALL IN VICTORIA.—FOURTH QUARTER, 1914.

Table showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	October.		November.		December.		Quarter.	
	Total.	Average.	Total.	Average.	Total.	Average.	Total.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	38	278	155	183	200	158	393	619
Fitzroy, Eumerella, and Merri Rivers	62	277	168	191	173	169	403	637
Hopkins River and Mount Emu Creek	34	234	165	189	265	171	464	594
Mount Elephant and Lake Corangamite	21	229	173	190	262	169	456	588
Cape Otway Forest ...	58	329	265	244	314	231	637	804
Moorabool and Barwon Rivers	26	232	193	194	344	195	563	621
Werribee and Saltwater Rivers	20	225	179	189	419	218	618	632
Yarra River and Dandenong Creek	24	324	279	277	392	323	695	924
Koo-wee-rup Swamp ...	28	327	250	262	355	281	633	870
South Gippsland	34	365	196	266	367	317	597	948
Latrobe and Thomson Rivers	28	356	242	282	323	311	593	949
Macallister and Avon Rivers	26	226	148	195	394	253	568	674
Mitchell River	35	269	199	203	391	238	625	710
Tambo and Nicholson Rivers	54	283	213	183	368	270	635	736
Snowy River	97	337	242	213	442	267	781	817
Murray River	4	174	96	144	217	146	317	464
Mitta Mitta and Kiewa Rivers	15	318	155	261	321	249	491	828
Ovens River	5	317	204	245	291	237	500	799
Goulburn River	5	224	152	186	267	184	424	594
Campaspe River	8	191	170	162	226	179	404	532
Loddon River	3	158	158	136	211	129	372	423
Avoca River	1	143	131	122	121	118	253	383
Avon and Richardson Rivers	2	137	104	114	118	99	224	350
Eastern Wimmera	4	184	146	149	171	131	321	464
Western Wimmera	11	184	156	133	132	98	299	415
Mallee District	2	118	113	92	136	87	251	297
The whole State ...	20	225	165	169	245	176	425	570

100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

VICTORIAN RAINFALL.

In the following table is given the average rainfall in each district in Victoria for the last three months of the year 1914, and also for the year itself, compared with the normal. For the purposes of this table 180 representative stations have been chosen, mainly with due regard to geographical position of the stations, their general peculiarities with respect to rainfall distribution, and their importance from an agricultural stand-point.

From a perusal of the table it will be seen that the month of October was almost devoid of rain, except in Gippsland and the Western District. November showed an excess in most of the northern areas and parts of the west; for the month of December the rainfall throughout the State, with the exception of the northern Mallee and isolated portions of the north-east (more particularly those of higher elevation), was very much above the average, especially so with regard to the western portions of the central district.

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
Mallee North ..	District Mean..	1	92	78	553
	Normal	109	65	88	1,104
	Per cent. above normal	..	+42	..	..
	„ below „	−99	..	−11	−50
Mallee South ..	District Mean..	0	115	178	750
	Normal	115	89	91	1,359
	Per cent. above normal	..	+29	+96	..
	„ below „	−100	..	..	−45
Northern Wimmera ..	District Mean..	1	154	139	846
	Normal	152	110	98	1,600
	Per cnet. above normal	..	+40	+42	..
	„ below „	−99	..	..	−47
Southern Wimmera ..	District Mean..	1	140	199	1,029
	Normal	194	136	110	1,980
	Per cent. above normal	..	+3	+81	..
	„ below „	−99	..	..	−48
Lower Northern Country	District Mean..	1	136	157	764
	Normal	146	119	107	1,588
	Per cent. above normal	..	+14	+47	..
	„ below „	−99	..	..	−52
Upper Northern Country	District Mean..	5	146	239	1,095
	Normal	197	151	131	2,037
	Per cent. above normal	..	..	+82	..
	„ below „	−97	−3	..	−46
Lower North-East ..	District Mean..	3	141	347	1,706
	Normal	265	194	189	2,770
	Per cent. above normal	..	..	+84	..
	„ below „	−99	−27	..	−38

VICTORIAN RAINFALL—*continued.*

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
Upper North-east ..	District Mean	15	229	294	2,568
	Normal	383	305	285	4,213
	Per cent. above normal	..	..	+3	..
	,, below ,,	−96	−25	..	−39
East Gippsland ..	District Mean.. ..	65	221	400	2,336
	Normal	308	226	273	3,049
	Per cent. above normal	..	..	+47	..
	,, below ,,	−79	−2	..	−23
West Gippsland ..	District Mean.. ..	21	202	354	2,345
	Normal	330	255	270	3,391
	Per cent. above normal	..	..	+31	..
	,, below ,,	−94	−21	..	−31
East Central	District Mean.. ..	19	255	415	2,567
	Normal	337	273	283	3,467
	Per cent. above normal	..	..	+47	..
	,, below ,,	−94	−7	..	−26
West Central	District Mean.. ..	13	208	317	1,530
	Normal	212	172	157	2,264
	Per cent. above normal	..	+21	+102	..
	,, below ,, ..	−94	..	..	−32
North Central ..	District Mean.. ..	6	195	272	1,495
	Normal	245	199	157	2,583
	Per cent. above normal	..	..	+73	..
	,, below ,, ..	−98	−2	..	−42
Volcanic Plains ..	District Mean ..	16	173	250	1,498
	Normal	240	184	160	2,512
	Per cent. above normal	..	..	+56	..
	,, below ,, ..	−95	−6	..	−40
West Coast	District Mean.. ..	48	200	208	2,084
	Normal	281	193	182	3,049
	Per cent. above normal	..	+4	+14	..
	,, below ..	−83	..	..	−32

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

POTASH FROM WOOL WASHING.

A Bradford correspondent revives a suggestion that wool-washing establishments should put down plants for the recovery of potash from their waste liquor, as is largely done on the Continent.

Although the potash recoverable in the process of wool washing is insignificant in amount compared with the German production from mineral sources, the operation of recovery is profitable, and were de-suinting the general practice in Bradford, instead of the rare exception, it is probable that a fair quantity of potash could be obtained.

Carbonate of potassium is the chief constituent of the "suint," or non-fatty portion of the secreted matter which adheres to the wool as it grows on the sheep's back. In this country, suint and grease are usually removed together in one operation, and recovery of the grease only is attempted.

It has been stated that one firm in Bradford alone annually pours down the drain with its waste liquor potash salts to the value of over £25,000.

On the Continent the potash is recoverable by subjecting the wool to a *preliminary* steeping in cold water, which dissolves the salts and leaves the grease behind. In the Roubaix district the production of potash salts from wool washing is said to amount to considerably over £100,000 annually.

The usual explanations given for the neglect of desuinting in this country are either that it is not worth while, or that cold water steeping tends to make the wool felt, but probably the real reason is the innate *conservatism* of the English *temperament*, which repels new ideas, and is reluctant to embark on experiments.—*Fertilizers*, 19th September, 1914.

Wool washing works are situated throughout Australia, and there is no doubt but that thousands of pounds' worth of potash is wasted annually.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

MONTHLY REPORT ENDING 14TH FEBRUARY, 1915.

The most notable feature of the past month in connection with the competitions was the extremes of temperatures. The readings taken in the roosting houses varied from 47 to 108 degrees, while the sun reading on one occasion reached 153 degrees.

One hen of the heavy breeds died with the heat on that day.

It speaks volumes for the present-day breeders that the hens as a body performed so well under such trying conditions.

A large number of hens are in full moult, while two or three have finished and again laying. The general health of the birds is good, and taking into consideration the number of birds in moult, the egg output is good.

The rainfall for the month was 55 points.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th Jan.	15th Jan. to 14th Feb.	Total to date—10 months.	
		LIGHT BREEDS.				
		WET MASH.				
25	White Leghorns	J. H. Gill	1,304	133	1,437	1
36	"	E. A. Lawson	1,299	135	1,434	2
26	"	Mrs. H. Stevenson	1,217	159	1,376	3
10	"	R. Hay	1,185	133	1,318	4
16	"	A. R. Simon	1,192	123	1,315	5
9	"	J. J. West	1,192	111	1,303	6
17	"	F. Doldissen	1,143	139	1,282	7
11	"	C. J. Jackson	1,120	153	1,273	8
10	"	Marville Poultry Farm	1,127	145	1,272	9
4	"	Giddy and Son	1,129	135	1,264	10
33	"	W. G. Osburne	1,123	140	1,263	11
40	"	J. Schwabb	1,125	124	1,249	12
45	"	H. C. Brock	1,113	134	1,247	13
37	"	S. Brown	1,113	129	1,242	14
29	"	V. Little	1,104	120	1,224	15
23	"	S. Buscumb	1,078	135	1,213	16
35	"	W. Tatterson	1,084	110	1,194	17
1	"	F. G. O'Bree	1,057	125	1,182	18
15	"	E. Waldon	1,049	127	1,176	19
8	"	F. W. Brine	1,058	114	1,172	20
47	"	W. G. Swift	1,039	128	1,167	21
30	"	G. W. Robbins	1,037	127	1,164	22
20	"	A. W. Hall	1,007	153	1,160	23
44	"	A. Ross	1,064	93	1,157	24
22	"	B. Mitchell	1,014	142	1,156	25
14	"	F. C. Western	986	136	1,122	26
48	"	Bennett and Chapman	994	127	1,121	27
28	"	Utility Poultry Farm	1,010	110	1,120	28
2	"	J. C. Armstrong	998	116	1,114	29
24	"	C. Pyke	1,012	101	1,113	30
34	"	W. A. Rennie	998	107	1,105	31
6	"	C. R. Jones	980	125	1,105	
38	"	G. Hayman	990	114	1,104	33
12	"	A. H. Mould	994	105	1,099	34
3	"	T. A. Pettigrove	976	107	1,083	35
32	"	Gleadell Bros.	938	141	1,079	36
18	"	All-lay Poultry Yards	946	129	1,075	37
42	"	E. W. Hippe	954	120	1,074	38
41	"	Doncaster Poultry Farm	939	132	1,071	39
13	"	H. Hanbury	959	106	1,065	40
5	"	A. Mowatt	931	122	1,053	41
31	"	E. H. Bridge	929	118	1,047	42
43	"	G. Mayberry	884	134	1,018	43
39	"	R. L. Appleford	866	139	1,005	44
21	"	R. A. Lewis	871	117	988	45
49	"	A. Beer	841	112	953	46
50	"	F. G. Silbereisen	807	139	946	47
7	"	B. Cohen	766	144	910	48
46	"	C. L. Sharman	763	135	898	49
27	"	Walter M. Bayles	773	117	890	50
		Total	51,078	6,320	57,398	

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Jan.	15th Jan. to 14th Feb.	Total to date—10 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		DRY MASH.				
60	White Leghorns ..	W. N. O'Mullane ..	1,301	159	1,460	1
55	.. ..	E. A. Lawson	1,254	128	1,382	2
51	.. ..	Moritz Bros.	1,092	143	1,235	3
53	.. ..	C. Lawson	1,093	115	1,208	4
65	.. ..	W. G. Osburne	1,117	86	1,203	5
61	.. ..	H. Hanbury	1,057	142	1,199	6
58	.. ..	Miss L. Stewart	1,060	102	1,162	7
59	.. ..	F. G. Silbereisen ..	973	129	1,102	8
68	.. ..	E. W. Hippe	968	131	1,099	9
63	.. ..	Hanslow Bros.	979	112	1,091	10
62	.. ..	A. Greenhalgh	956	133	1,089	11
52	.. ..	Myola Poultry Farm ..	938	117	1,055	12
70	.. ..	W. H. Robbins ..	921	124	1,045	13
69	.. ..	C. J. Beatty	902	134	1,036	14
64	.. ..	E. A. Carne	920	115	1,035	15
54	.. ..	G. Carter	924	100	1,024	16
67	.. ..	Walter M. Bayles ..	875	138	1,013	17
57	.. ..	C. J. Jackson	893	115	1,008	18
66	.. ..	S. Brown	641	100	741	19
		Total	18,864	2,323	21,187	
		HEAVY BREEDS.				
		WET MASH.				
77	Black Orpingtons ..	J. McAllan	1,201	130	1,331	1
71	.. ..	J. Ogden	1,104	116	1,220	2
88	.. ..	H. H. Pump	1,109	89	1,198	3
89	.. ..	Marville Poultry Farm ..	1,086	101	1,187	4
84	Rhode Island Reds	J. Mulgrove	1,037	79	1,116	5
87	Black Orpingtons ..	A. Douglas	967	128	1,095	6
81	.. ..	D. Fisher	1,001	93	1,094	7
76	.. ..	W. P. Eckermann ..	971	113	1,084	8
82	.. ..	J. H. Wright	981	94	1,075	9
75	.. ..	Fairdeal Poultry Farm ..	947	96	1,043	10
73	.. ..	J. A. McKinnon ..	902	117	1,019	11
72	.. ..	T. W. Coto	897	106	1,003	12
74	.. ..	S. Brown	905	96	1,001	13
83	.. ..	Cowan Bros.	818	72	890	14
85	Golden Wyandottes	J. C. Mickelburgh ..	691	74	765	15
78	Red Sussex ..	Jorgen Anderson ..	669	77	746	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	632	86	718	17
86	Buff Wyandottes ..	W. G. Swift	473	62	535	18
		Total	16,391	1,729	18,120	
		DRY MASH.				
100	Black Orpingtons ..	D. Fisher	966	87	1,053	1
99	.. ..	J. H. Wright	912	110	1,022	2
98	.. ..	A. Greenhalgh	894	109	1,003	3
97	.. ..	J. McAllan	895	94	989	4
91	.. ..	C. E. Graham	824	88	912	5
94	.. ..	T. W. Coto	830	75	905	6
96	Rhode Island Reds	Myola Poultry Farm ..	807	87	894	7
92	Black Orpingtons ..	Fairdeal Poultry Farm ..	769	96	865	8
93	.. ..	Myola Poultry Farm ..	747	73	820	9
90	White Plyth. Rocks	Mrs. G. R. Bald ..	622	102	724	10
95	.. ..	C. L. Hewitt	429	40	469	11
		Total	8,695	961	9,656	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

PLANTING.

In preparing land for planting out—and this should be commenced right away, so as to allow the soil to sweeten—it should be subsoiled, so as to produce good results in after years. Subsoiling will add to the age and vigour of the trees; it will materially increase the crop; and it will considerably lessen the expense of fertilizers. Drainage is another most important factor in successful fruit culture; but while, perhaps, drainage may be delayed for a few years, if the other initial expenses are extensive, it must again be emphasized that proper subsoiling cannot be carried out after the trees are planted.

GREEN MANURES.

The exceedingly dry months of January and February will have had the effect of considerably weakening the soils, and reducing the humus content. It will be advisable wherever at all possible to put in a crop of green manure to supply humus, nitrogen, and other beneficial factors to the soil. This should be done as soon as the fruit is off the trees, and the earlier the better.

An early crop is a distinct advantage. The cover crop should make good growth before winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in the early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will well cover the surface before winter.

PESTS.

Rust-infected plum and peach leaves, as well as the foliage of stone fruits that have been attacked by this and other fungus diseases, such as shothole, &c., should be burned if possible. This will minimize the possibility of future attacks. The same treatment should be given to foliage where red spider or the bryobia mite have been in evidence.

It may appear somewhat early to think of dealing with peach aphis. But our knowledge of its habits and the necessary sprays to combat it is increasing every year; and it is most apparent that, if the pest is to be attacked with a red oil emulsion, the mixture must be used earlier than hitherto.

It is recognised that one of the easiest and most useful methods of dealing with this pest is to spray the trees in their dormant stage with red oil emulsion. In orchards where, some years ago, half-a-dozen sprayings with a nicotine spray were given, often with very little visible effect, a marvellous change has been effected by the use of red oil in winter. One spraying has been effective in almost clearing out the pest; and where the aphides have reappeared in the spring time, their numbers have been so small that a light spraying with nicotine solution has been all that is necessary. This applies to both green and black aphis.

Vegetable Garden.

All vacant plots should be given a liberal dressing of stable manure, and then well and deeply dug. For winter growth, the beds should be elevated somewhat above the ordinary summer level. That is, the path surface may be on a lower level, the plot soil being well thrown up and boldly ridged. This will give a certain amount of drainage, and will insure warmer and better soil; the vegetables should succeed more in this class of bed than any other. The vegetable garden, and also the seed beds, should be kept free of any weeds, and a good cultivation kept up all through. Seedlings of cabbages, cauliflowers, lettuce, and celery may be transplanted out; and seeds of cabbage, cauliflower, lettuce, early peas, swede turnips, carrot, parsnip, and early onions may be sown.

Flower Garden.

The various plants in the flower garden will require liberal food supplies at the present time. The soil having been so frequently watered during summer, the food supplies of various plants have been considerably reduced by the process of "washing out"; and as it is the season of the year when the most popular flowers of the year will be blooming, viz., dahlias, chrysanthemums, and roses, the plants will require a good stimulus. Liquid manures should be used in preference; and these should always be used in a weak solution first, gradually making it stronger as the plant becomes accustomed to the feeding. Once a week is sufficient for liquid manures, and the plants should never be excessively fed. Animal manures may be prepared for liquid manures by soaking for a few days at the rate of 1 lb. of well-rotted and well-preserved manure in one gallon of water. A few handfuls of soot thrown in this makes a great improvement in the food. If ordinary chemical manures, such as nitrate of soda, superphosphate, or sulphate of ammonia, be used, the portion of one ounce to four gallons will be ample for the weekly supply. Excessive manuring and over-feeding tend to gross growth in floriculture. All classes of spring flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should have been some time previously dug well in and mixed with the soil, and all heat should have disappeared. If much manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added with advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freezias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper. Wherever aphis and red spider occur the plants should be well sprayed with benzole emulsion, nicotine, "Pestend," "Soaperine," or some other preventive, in order to protect the coming flowers. Mildew attacks on the rose should also be warded off by the use of sulphur. The sulphur may either be dusted on the plant or it may be scattered on the ground around and under the plant. March is the month when the showy and fine summer annuals are at their best. The asters and zinnias should be very fine; and these, combined with salpiglossis, miniature annual and herbaceous sunflowers, phlox, and many other popular hardy annuals, are all now at their best. These will require a fair quantity of water and manure mulching; and the plants

will be considerably helped if the blooms which have passed their prime are kept cut off.

All hardy annual, biennial, and perennial seeds may now be planted; among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, pentstemon, pansy, gallardia, &c.

In planting sweet peas, the soil should be fairly well watered beforehand, so that it is well moist right through. The best result will be obtained if they are first planted in boxes or pots, and when two or three inches high transplanted out singly into their permanent situation. In planting out the seedlings the soil should be well prepared, so that the roots may have a free run in all directions. The seedlings should be given ample room, having a space of at least nine inches between each plant. Staking should proceed at an early stage, and the plants should be encouraged to climb from the beginning.

REMINDERS FOR APRIL.

Live Stock.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows may now be spayed.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars.

SHEEP.—After such a season as just passed through the bulk of the lambing will be erratic and late, but, where early lambs can be produced, transfer the ewes with lambs at foot to best feed as soon as dropped. Plant fodder crops and fatten all possible; the demand will be extreme for all classes of mutton. Castrate ram lambs when a few days old; defer tailing them until ewe lambs are ready. After rain, when dust is settled, clear wool from the eyes of young merino sheep and from the udders of stud ewes about to lamb. Drench sick weaners, and put them into hospital paddock, and all inferior fleeced sheep into fattening paddock.

POULTRY.—Do not feed much grain this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Remove all male birds from pens. Add to drinking water one packet Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit shell and charcoal should always be available.

Cultivation.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Vetches. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month

should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

VINEYARD.—Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of vinegar flies (*Drosophila funebris*). If present, destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c. See February *Journal*, 1914.

ALSATIAN POTASH.

In the *Progres Agricole* of 18th October, 1914, Professor L. Degrully, of the Montpellier National School of Agriculture (France), discusses the advisability of manuring young vineyards during the winter following their field grafting.

He decides in favour of manuring, in order to insure a well-developed root system and solid frame, but advises moderation and the application of half the quantity of manure usually allowed for vines in full bearing. He comments on the difficulty in procuring potash sales, now that the war has shut off supplies from the mines of Strassfurth, in Germany, which have hitherto been the main source of potash used by French agriculture. "Potash must therefore be sought either in organic manures, which contain more or less of it (and sometimes none at all), according to their origin, or in nitrate of potash, which comes to us from India, Egypt, and other countries of the Far East." He also recommends the use of gypsum to unlock soil reserves of potash, and recalls "that nitrates seem to play a similar part, according to experiments conducted in England and Switzerland."

As regards the future, "The question is already solved," says Professor Degrully, who shows with cheery optimism how the recovery of her lost Provinces will render French agriculture independent of Strassfurth. "Upper Alsace . . . contains very important deposits, which have been explored within the last few years by the Alsatian Geological Service. . . . Prospecting has shown the Wittelsheim Basin to contain 1,472,000,000 metric tons of mineral, which, with an average test of 22 per cent. potash, would represent 300,000,000 tons of pure potash. Admitting that the world's consumption were to remain as it is to-day, Wittelsheim would suffice for the requirements of the next 493 years. Upper Alsace will shortly have once again become French soil, and in it we shall easily find all the potassic manures necessary for our cultures."

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 4. 10th April, 1915.

RESULTS OF FIELD TESTS WITH WHEAT AT EXPERIMENT FARMS.

SEASON 1914.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The Season.

The season 1914 will long be remembered in our agricultural history as the driest season ever experienced throughout the wheat belt of Australia.

Throughout the winter and spring the rain-bringing Antarctic disturbances, which usually course from west to east across the temperate portion of the continent, have kept hundreds of miles south of their usual track, with the result that the wheat-growing areas of the Commonwealth received barely sufficient rain to germinate the seed, much less bring the struggling crops to maturity.

It was not so much the total rainfall for the year as the seasonal distribution of the rain that was responsible for the comparative failure of the crop in Victoria, South Australia, and the Riverina. Judged by the criterion of total rainfall, the season was much drier than 1902; but judged by the amount of "useful rain," *i.e.*, rainfall during the growing period of the wheat crop, the season was absolutely without precedent in the annals of the State.

The efficiency of a rain depends largely on the season of the year in which it falls, and the amount of evaporation and the soil temperature at the time of fall. An isolated fall of less than half an inch in January and February is of little use on account of the high soil temperatures and intense evaporation. A few days' warm weather, or a brisk wind, will dissipate the moisture and render the soil as dry as

ever. On the other hand, the same fall of rain in June, July, or August is of considerable value, because of the greatly lessened evaporation and low soil temperatures. A district in which the bulk of the rain falls in winter is far more effective for wheat production than one of equal rainfall where the rain falls mainly in the summer months It is for this reason that wheat is being successfully grown in South Australia and Victoria on an annual rainfall 5 to 6 inches lower than that regarded as safe in Northern New South Wales.

Now, the extraordinary features of last season have been (1) the *practical absence of winter rains, (2) the abnormal seasonal distribution* of the rain, (3) uniformly heavy evaporation, and (4) the excessively hot spring.

A simple summary, showing the monthly rainfall and evaporation at three representative centres—Rutherglen, Werribee, and Wyuna—will convey more eloquently than any description the outstanding features of the season. Incidentally, too, the figures will serve to give meaning to the results of the various field tests:—

Table I.

Summary of Rainfall and Evaporation, Season 1914

Month.	Rainfall.			Evaporation.		
	Rutherglen.	Werribee.	Wyuna.	Rutherglen.	Werribee.	Wyuna.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1. January	1·10	·89	·27	12·38	7·76	14·79
2. February	·03	·11	·05	8·92	6·50	10·19
3. March	2·00	·94	·06	7·65	5·57	7·59
4. April	1·58	1·50	·85	3·66	3·02	4·04
5. May	2·17	1·45	1·01	1·68	1·49	2·00
6. June	·60	·91	·27	1·05	·99	1·22
7. July	·88	·91	·41	1·08	·93	1·94
8. August	·45	·38	·18	1·77	2·59	2·60
9. September ..	·47	1·32	·17	3·74	3·06	4·58
10. October	Nil	·12	Nil	7·82	5·96	7·86
11. November ..	1·06	1·65	1·00	9·36	6·40	8·34
12. December	4·19	3·04	1·58	10·27	6·15	9·23
Total for year ..	14·53	13·22	5·85	69·38	50·51	74·38

Table II.

—	Rutherglen.	Werribee.	Wyuna.
Average annual rainfall	21·5	20·5	14·5
Rainfall for 1914	14·53	13·22	5·85
Normal rainfall during growing period ..	12·04	10·36	9·82
Rainfall during growing period, 1914 ..	4·57	5·19	2·04

These tables bring out very clearly several points of interest:—

1. The abnormally low useful rainfall—4.57 inches for Rutherglen, 5.19 at Werribee, and only 2.04 at Wyuna—for the six winter months, whilst the average falls for the same period are respectively 12.04, 10.36, 9.82.
2. The excessive evaporation, from a free water surface, viz., 69.38 inches at Rutherglen, 50.51 inches at Werribee, and 74.38 inches at Wyuna for the year.
3. The dry hot winds in October reflected in the excessive evaporation for the last half of the month, when the daily loss by evaporation approximated half an inch.
4. The heavy falls of "non-useful" rain in late December, amounting to more than 25 per cent. of the annual fall.

It will be noted from the tables that the best winter rainfall was recorded at Werribee. This is reflected in all the returns from this centre. At Wyuna, fertilizer, manurial, variety, seed selection, and tillage tests were carried out. No crop was, however, harvested. Germination of every plot was excellent, but the crop had to struggle for five months, during which only 1.03 inches fell, most of which was in light showers. The crop began to head out in early October, but was fed off in the hope of a good rain bringing along a vigorous second growth. The six weeks' hot weather in October and November, without a drop of rain, led to the absolute failure of the crop, in common with other non-irrigated crops in the district.

At Rutherglen, all plots, except the permanent fertilizer tests, looked well in spring, but the abnormally hot dry weather during October proved fatal to good yields, and plots which by flag and straw development promised fully 20 bushels ultimately yielded only 9 to 12 bushels.

At both Werribee and Rutherglen the outstanding feature of the tests this season were the yields obtained from the green manurial trials. These will be dealt with, however, at a later stage. The principal tests of interest at these centres are:—

1. Variety wheat tests.
2. Permanent fertilizer tests.
3. Green manurial tests.
4. Cultural and tillage trials.

We will consider the results seriatim.

Variety Wheat Trials.

At Werribee, twenty-two plots of half an acre each were sown on Paddock 7 NE with 1½ cwt. of superphosphate. Most of the varieties tested are well known, and have been described from time to time in these columns. As far as possible, every plot was given absolute equality so far as allowances of seed and manure and mode of cultivation were concerned. Also, the various plots were sown practically simultaneously. Similar procedure was followed in sowing the plots in the permanent experiment field at Rutherglen, except that the

allowance of superphosphate was 1 cwt. per acre for all plots. The results of the test, arranged in order of yield, are as follows:—

Table III.

Central Research Farm, Werribee.

(Rainfall, Seed to Harvest, 5.19 in.)

	bush.	lbs.		bush.	lbs.
Penny	22	16	Federation . ..	16	14
Major	20	12	King's Early	14	48
Commonwealth . ..	19	34	American 8 ..	14	20
Gluyas	18	56	Bobs	13	26
Marshall's .. .	18	42	College Eclipse . ..	13	10
Federation (Selected) ..	18	34	Comeback .. .	12	42
Currawa	18	14	Zealand Blue .. .	11	38
Yandilla King .. .	18	6	*Huguenot* .. .	11	4
Viking	16	52	Bunyip	8	14
Darts	16	30	Firbank	7	48
Avoca	16	28			

Table IV.

Results of Variety Tests, Rutherglen Experiment Farm, 1914–15.

(Rainfall, Seed to Harvest, 4.57 in.)

In Order of Yield.	No. of Plot in Field.	Variety.	Yield per Acre.	
			bush.	lbs.
1	18	King's Early	10	3
2	12	Gluyas	9	36
3	24	New Crossbred 4027	9	16
4	11	Currawa	9	8
5	25	New Crossbred 4028	8	56
6	16	Federation (Selected)	8	56
7	26	New Crossbred 4055	8	48
8	15	College Eclipse	8	45
9	19	Bunyip	8	28
10	28	New Crossbred 4072	8	21
11	22	Indian 18	8	12
12	23	Indian 20	7	53
13	10	Commonwealth	7	52
14	3	American 8	7	45
15	13	Viking	7	42
16	29	New Crossbred 4073	7	34
17	31	Federation (Check)	7	30
18	20	Indian 5	7	29
19	7	Dart's Imperial	7	26
20	1	Federation (Check)	7	20
21	2	Yandilla King	7	16
22	14	Comeback	7	1
23	6	Marshall's No. 3	6	43
24	30	New Crossbred 4084	6	38
25	9	Bobs	6	30
26	32	Cedar	6	29
27	27	New Crossbred 4062	6	1
28	21	Indian 6	5	53
29	8	Bayah	5	24
30	17	Firbank	4	56
31	4	Huguenot	4	7
32	5	Zealand Blue	3	51

From these results it appears that at Werribee the late maturing varieties have generally given the best results, whilst at Rutherglen the early maturing types have shown up best. Thus, in the Werribee results, with the exception of Gluyas, which gave 18 bushels 56 lbs. per acre, the first ten varieties on the list are either very late or mid-season wheats. On the other hand, of the ten leading varieties at Rutherglen, all, save three, namely, New Crossbred 4027, Currawa, and Federation, are early maturing varieties.

The nature of the season and the incidence of the rain is mainly responsible for this result. Thus, at Rutherglen, the spring rains absolutely failed. October was the driest and hottest October ever experienced at this centre. The early-ripening types were well on the way to maturity when the scorching winds of late October arrived. They therefore suffered relatively less from this premature baptism of heat than the late varieties.

At Werribee, on the other hand, the general development of the crop was much behind that at Rutherglen, the rain of late September (1.32 inches) and November (1.65 inches), and the more temperate weather prolonged the growing period of the crops, and turned the scale in favour of those varieties that were really the most backward in early spring. The slow-growing varieties received the greatest benefit from these rains, and ultimately gave the best returns.

When a batch of early and late maturing varieties are sown on any one farm, the nature of the season will determine which type will succeed best. Generally speaking, wherever good spring rains or a prolonged growing period can be relied on, slow-maturing types will give the best results. On the other hand, where spring rains are uncertain, and hot drying winds are prematurely ushered in, early maturing types will give the best results. South of the Dividing Range, in Gippsland, and in the mountainous districts of the North-East, late varieties, like Marshall's No. 3, will give the best returns. North of the Divide, mid-season wheats, like Federation and Currawa, Dart's Imperial, do well; whilst in the drier mallee districts, early-maturing types like Gluyas, Mac's White, and King's Early will generally give best results.

Permanent Fertilizer Trials.

The results of the various fertilizer trials may now be considered.

The yields on these plots at Rutherglen are lower than those obtained from the other series of experimental plots, and much below the yields of the bulk field tests. This is due partly to the fact that the plots are situated on poor soil, but chiefly because they were sown too late.

Table V. gives the yields for 1914, and the average returns from these plots for the past three years. During 1912, the variety Zealand Blue was sown on all plots. The variety Federation was sown in all experimental tests in 1913 and 1914.

A survey of this table will reveal several interesting features—

1. The value of water-soluble phosphates, like super. for wheat, as compared with basic slag and bonedust.
2. The marked result from relatively heavy dressings of superphosphate as compared with the amount generally applied (56 lbs.).

3. The non-necessity for nitrogenous manures on well-worked bare fallows.
4. The ineffectiveness of lime and insoluble phosphates in dry seasons.

TABLE V.

RESULTS OF PERMANENT FERTILIZER TRIALS.

Rutherglen Experiment Farm.

Three Seasons.

No. of Plot.	Treatment.	1912.	1913.	1914.	Average for 3 Years.
		bush.	bush.	bush.	bush. per acre
1	Farmyard Manure 10 tons per acre	13.3	27.9	2.1	14.4
2	Farmyard Manure 10 tons per acre + Lime 10 cwt.	17.8	28.3	5.5	17.2
3	No Manure	9.4	18.5	.6	9.5
4	Superphosphate ½ cwt.	14.4	28.5	1.8	14.9
5	Superphosphate 2 cwt.	18.7	31.8	2.4	17.6
6	Superphosphate 1 cwt.	16.2	31.0	3.5	16.9
7	Super. 1 cwt. + Sod. Nit. ½ cwt., with seed ..	19.0	28.2	3.4	16.9
8	Super. 1 cwt. + Sod. Nit. ½ cwt., in Spring ..	17.3	31.8	3.4	17.5
9	*Super. 1 cwt. + Sulph. Ammonia ½ cwt.* ..	14.9	29.8	3.4	16.0
10	Super. 1 cwt. + Sulph. Ammonia ½ cwt. x *Potash ½ cwt.*	12.8	29.3	2.6	15.2
11	No Manure	12.1	20.1	.6	10.9
12	*Bonedust (P_2O_5=1 cwt. Super.) 1 cwt.* ..	*13.8*	*28.1*	*1.0*	*14.3*
13	Basic Slag (Thomas' Phosphate) 1 cwt. ..	13.9	28.2	1.2	14.4
14	Basic Slag (Thomas' Phosphate) ½ cwt. Superphosphate ½ cwt.	13.4	28.6	1.4	14.5
15	Super. 1 cwt. + Lime 5 cwt.	17.4	28.7	2.1	16.1
16	Super. 1 cwt. + Lime 10 cwt.	18.3	30.9	1.4	16.9
17	Super. 1 cwt. + Lime 20 cwt.	20.2	30.2	1.7	17.4
18	No Manure	12.8	19.1	.3	10.7
19	Super. 1 cwt. + Potash ½ cwt.	17.6	31.3	1.1	16.7

Consider the various points mentioned above. Table VI. summarises the crop and monetary returns from the various dressings of superphosphate.

TABLE VI

LIGHT AND HEAVY DRESSINGS OF SUPERPHOSPHATE.

Plot.	Treatment.	Yield.	Increase Over no Manure Due to Manuring.	Value of Increase, at 3s. 4d. Per Bushel (Gross Profit).	Cost of Manure.	Net Profit over Unmanured Plot.
		bushels.	bushels.	£ s. d.	£ s. d.	£ s. d.
3	No manure ..	9·5	..	..	..	..
4	Super., ½ cwt. ..	14·9	5.4	0 18 0	0 2 3	0 15 9
6	Super., 1 cwt. ..	16·9	7.4	1 4 8	0 4 6	1 0 2
5	Super., 2 cwt. ..	17·6	8.1	1 7 0	0 9 0	0 18 0

From these figures, the average of three seasons, it appears that a dressing of 1 cwt. super. is the most profitable amount to apply in practice. The first ½ cwt. produces an increase of 5.4 bushels per acre, which, at 3s. 4d. = 18s. over the unmanured crop. Deducting the value of the manure, this leaves a net profit of 15s 9d. per acre. An application of 1 cwt. per acre produces a net increase of 7.4 bushels over the unmanured plot, which, at 3s. 4d. per bushel = 24s. 8d. leaving a net profit over the unmanured plot of 20s. 2d. per acre Two hundredweight of super. produces a still higher yield, but the net profit is only 18s., as compared with 20s. 2d. per acre with the 1-cwt. application.

The indirect effect of the heavier dressings in stimulating the growth of grass on the stubbles and grass land must not be lost sight of. Profits on a wheat farm come from wool and lambs as well as from wheat, and increased carrying capacity is therefore as much to be desired as increased wheat harvest. Note, too, that, in respect to the 1-cwt. dressing, the extra crop, as compared with the ½-cwt. application, gave a higher net profit in each of the three seasons.

Nitrogenous Manures.—As has been demonstrated in previous years, the time has not yet arrived when nitrogenous manures will give payable returns on well-fallowed wheat lands. This is a very fortunate circumstance for our wheat farmers, for nitrogenous manures are the most costly of all artificial fertilizers. This may be seen by comparing plots 7, 8, and 9 with plot 6.

As an average of three years' results, superphosphate (1 cwt.) gives a return of 16.9 bushels, ½ cwt. of nitrate of soda per acre (costing an extra 7s. 6d.) applied with the seed gives no extra return. The same quantity applied in the spring gives a slight increase of .6 bushels, not enough, however, to cover the extra cost of the manure. Sulphate of ammonia is apparently even less suitable, for the extra dressing is accompanied by a slight falling off in yield. The application of potash applied either with super. or with a combination of super. and sulphate of ammonia appears to depress the yield.

The failure of nitrogenous manures to stimulate wheat yields is not difficult to understand. The processes of nitrification are extremely active in our bare fallows, and far more nitrates are formed by bacterial activity during the process of fallowing than the wheat crop can normally use up. Consequently, additions of nitrates in the form of nitrate of soda are ineffective. In wet seasons, however, or in seasons with heavy spring rains, the nitrates in the surface soil may become leached out or even washed into the subsoil, leaving a temporary deficiency in the surface layers. Under these circumstances, applications in spring may lead to a marked stimulus in growth. On stubble ploughed land, or in regions of normally heavy rainfall, nitrates for a similar reason may prove of great advantage.

Lime.—Applications of lime have not, as yet, proved profitable at Rutherglen for wheat. In wet seasons applications of lime show up well, but in a dry season the apparent effect of increased quantities of lime is to depress the yields. In 1912 (wet season), there was a steady increase in the yield as we passed from the light to the heavy dressings. In 1914 (drought), there is a falling off in yield as the dressing of lime increases. Lime has given good results when applied with stable manure.

Stable Manure.—Plot 1 alone gave an average yield of 14.4 bushels. A supplementary dressing of lime (plot 2) gave 17.2 bushels.

Finally, a note regarding the various phosphates. Citrate-soluble phosphate applied as basic slag, or insoluble phosphate applied as bone-dust, are both inferior to water-soluble phosphate (super.) for wheat crops. Super. (1 cwt.) gives 16.9 bushels as an average of three years. The same quantity of phosphoric acid, in the form of basic slag (Thomas' phosphate), gives 14.4 bushels, and, in the form of bone-dust, 14.3 bushels, or in the form of a mixture of basic slag (56 lbs.) and super. (56 lbs.), 14.5 bushels.

In Table VII., the returns from a series of fertilizer plots at Werribee are summarized.

The plots are each ½ acre in area. In season 1913 the plots were sown on a late-prepared bare fallow, whilst in 1914 they were sown after leguminous crops cut for silage.

TABLE VII.

TABLE SHOWING RETURNS FROM PERMANENT FERTILIZER PLOTS, CENTRAL RESEARCH FARM, WERRIBEE.

Seasons 1913 and 1914.

Plot.	Treatment.	First Season (1913).		Second Season (1914).		Average for Two Seasons.	
		bus.	lbs.	bus.	lbs.	bus.	lbs.
1A	Super. 1 cwt. per acre	9	12	14	16	11	44
2A	Farmyard Manure 10 tons	11	49	10	56	11	22
3A	Farmyard Manure 10 tons, and Lime 10 cwt...	12	42	8	40	10	41
4A	No Manure	7	33	5	40	6	36
5A	Super. ½ cwt. per acre	11	6	9	16	10	11
6A	Super. 1½ cwt.	14	2	11	36	12	49
7A	Super. 2 cwt.	13	52	11	40	12	46
8A	Super. 1 cwt., and Nitrate of Soda 49 lbs. ..	13	36	8	8	10	52
9A	Super. 1 cwt., and Nitrate of Soda 49 lbs. (in *Spring*)	12	37	9	32	10	4
10A	Super 1 cwt. (Check Plot)	13	4	10	48	11	56
11A	Super. 1 cwt., and Sulphate of Potash ½ cwt...	12	0	9	4	10	32
12A	Super. 1 cwt., Sulphate of Potash ½ cwt., and *Nitrate of Soda ½ cwt.*	12	10	6	28	9	19
13A	Bone Fertilizer 1 cwt.	8	26	5	16	6	51
14A	Thomas' Phosphate 1 cwt.	8	53	4	28	6	40
15A	Super. ½ cwt., and Thomas' Phosphate ½ cwt...	12	5	5	38	8	52
16A	Super. 1 cwt., and Lime 5 cwt.	11	49	7	6	9	27
17A	Super. 1 cwt., and Lime 10 cwt.	12	21	6	0	9	10
18A	Super. 1 cwt., and Lime 20 cwt.	11	33	5	16	8	24
19A	*No Manure (continuously cropped)*	6	24	5	47	6	35
20A	Super. 1 cwt. (continuously cropped) ..	9	52	10	28	10	10

The return from the Werribee series of plots shows a marked general similarity to the results of the Rutherglen trials, except that the differences between the respective dressings are less marked. This might have been expected, for the last two winters at Werribee are among the driest ever recorded, consequently the respective dressings have not been able to exert their full effect on crop yields. Nor must it be forgotten that this land had, prior to the laying down of the permanent

experiment trials two seasons ago, been treated for many years with liberal dressings of phosphates. This would have the effect of levelling up all the yields, and masking the differential effects of the respective dressings.

In 1913 a series of plots were laid down at Rutherglen to test the values of different depths of ploughing, early and late fallowing, &c. The results for 1914 are summarized in Table VIII.

TABLE VIII.

SHOWING CULTURAL AND TILLAGE TESTS, RUTHERGLEN EXPERIMENT FARM.

Season 1914.

(Rainfall, Seed to Harvest, 4.57 in.)

Plot.	Treatment.	Results.	
		bus.	lbs.
1	Ploughed 3" deep July, summer cultivated	6	49
2	Ploughed 5" deep July, summer cultivated	6	49
3	Ploughed 7" deep July, summer cultivated	7	7
4	Ploughed 9" deep July, summer cultivated	8	10
5	Ploughed 3" and subsoiled, summer cultivation	7	16
6	Ploughed 5" and subsoiled, summer cultivated	7	30
7	Ploughed 7" and subsoiled, summer cultivation	8	42
8	Ploughed 5" deep July, and cultivated through summer ..	8	51
9	Ploughed 5" deep July, and cultivation neglected	6	36
10	Ploughed 5" deep October, and cultivated through summer ..	7	25
11	Ploughed 5" deep October, and cultivation neglected	5	33
12	Ploughed 5" deep just before seed time, and cultivated ..	3	27

Before any definite conclusions can be drawn from these tests, more data must be collected. It is worth noting, however, that whilst there seems to be little to choose between 3-inch and 5-inch ploughing, there does appear to be an advantage in deep stirring the soil. Thus, the plots ploughed 7 inches and 9 inches deep and the subsoiled plots gave substantial increases over the shallow-ploughed plots. The result is interesting, especially in view of the dryness of the season and the manifest difficulty we had in affecting consolidation of the soil on the deeper-worked plots. The after cultivation given to plots 1 to 7 was identical.

The results of plots 8 to 12 indicate that July fallow gives much better returns than October fallow, and a cultivated fallow is worth several bushels per acre more than a neglected fallow.

Finally, land ploughed immediately before seeding gave the smallest return of all the plots. This might have been expected. Time is a necessary factor in affecting a tilth, and securing that consolidation of the soil so essential for success, and stubble-ploughed land can only be expected to do well in seasons of heavy rainfall.

(To be continued.)

RESULTS OF TESTS, 1914.

LONGERENONG COLLEGE.

(Field Officer I. M. Tulloh.)

The importance of the wheat industry to the Commonwealth is obvious when it is considered that, roughly, 5,000,000 acres are annually harvested for grain in Australia. With the introduction and cultivation of drought-resistant varieties, areas which hitherto were considered unfit for wheat-growing have come under cultivation, and are now producing fair crops. Under present conditions the farmer, by using modern implements, has large areas under cultivation, and obtains a payable return from a very moderate yield per acre, but, as the country becomes more thickly populated, and land values increase, a more intense method of cultivation must be adopted, and a higher wheat yield per acre obtained. That the latter is possible is apparent when the number of important factors bearing on wheat-growing are considered, and which are not taken into serious consideration by the average farmer:—

(1) The preparation of the soil.
- (*a*) Fallowing.
- (*b*) Time of fallowing.
- (*c*) Working of fallow.
- (*d*) Rotation of crops.

(2) The selection of the seed.
- (*a*) Selection of varieties most suitable to the district.
- (*b*) The selection of the most prolific strains of that variety.
- (*c*) Graded seed.

(3) Rate of seeding.
(4) Time of sowing.
(5) Prevention of disease.
(6) Economical use of fertilizers.
(7) Treatment of the young crop

The only way to determine the adaptability of these various points to certain districts is by practical experiment. A farmer has neither the time nor the facilities for carrying out and obtaining accurate results from experimental work, hence the establishment of Government Experiment Stations throughout farming centres of the world. On these Experiment Stations a wide series of experiments are carried out, the majority of which all bear directly or indirectly towards one main object—to determine by the application of science to most thorough and systematic experimenting the methods by which the resources of the soil may be brought to bear, so that the highest possible returns may be obtained by the most economical means.

In 1912 a permanent scheme of experimental work was laid down at Longerenong, and the following experiments have since been carried out:—

1. Manurial tests.
2. Seed selection tests.
3. Seed production plots.
4. Rate of seeding tests.
5. Tests of barleys.
6. Stud breeding plots.
7. Crossbred trials.

In 1914 additional experiments have been included in —

8. Graded seed tests.
9. Time of sowing in conjunction with rate of seeding.
10. Forage plants.
11. Field trials of crossbreds.
12. Pasture manurial tests.

In order to put the results in proper perspective, some reference to the rainfall is necessary.

The following table summarizes the rainfall for the past three years:—

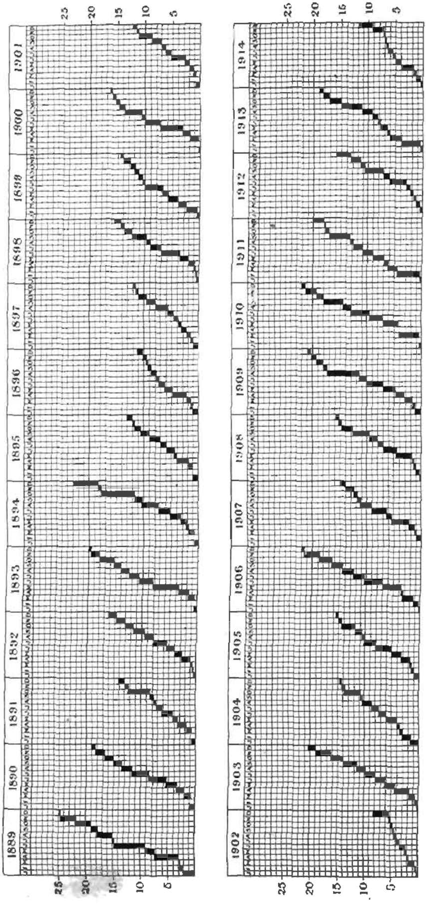
TABLE I.

SHOWING MONTHLY RAINFALL, LONGERENONG, FOR THE PAST THREE YEARS.

Month.	1912.	1913.	1914.	
January	0	18	42	
February	47	321	88	
March	55	209	41	
April	67	59	224	
May	**36**	**126**	**107**	Growing period of crop.
June	**195**	**46**	**77**	
July	**287**	**102**	**82**	
August	**115**	**200**	**36**	
September	**394**	**384**	**20**	
October	**70**	**219**	**18**	
November	177	95	209	
December	236	88	275	
Total	16·79	18·67	12·19	
Total rainfall during growing period	10·97	10·77	3·40	

The chart on the following page showing in graphical form the monthly distribution of rain during the past twenty-six years may be of interest in view of the extraordinarily dry year through which we have just passed. The information for the preparation of this chart was supplied by Mr. E. G. M. Gibson, of Longerenong College.

The rainfall of 1914 would probably have sufficed for a tolerably good crop had the incidence of the rain been normal. But the distribution was quite abnormal. Of the 12.19 inches of rain for the year.



RAINFALL CHART

LONGERENONG AGRICULTURAL COLLEGE

Vertical columns represent 1 Month. Vertical distances represent 1 Inch

only 3.40 fell during the growing period, all of which fell in light non-saturating showers. This undoubtedly was the reason for the crop failure in the district for 1914. What crops were grown on the experimental plots, therefore, in 1914 may be mainly attributed to the reserves of soil moisture conserved from the previous season.

The Manurial Trials.

The manurial trials consist of fourteen plots, the arrangement of which and the nature of the experiment can be seen in the table below. The yields from the various plots for the last two years are given:—

Plot.	Treatment (per Acre).	Yield per Acre.		Average for Two Years.
		1913.	1914.	
		Bush.	Bush.	
1	No manure	17·16	2·11	9·63
2	Super., 56 lbs.	25·66	5·10	15·38
3	" 1 cwt.	29·16	5·81	17·48
4	" 2 cwt.	29·66	6·10	17· 8
5	" 1 cwt.; lime, 5 cwt.	29·00	6·76	17·88
6	" 1 cwt.; lime, 10 cwt.	29·83	7·14	18 48
7	" 1 cwt.; nitrate of soda, 40 lbs. ..	30·66	6·43	18 50
8	No manure	17·66	3·91	10·78
9	Thomas' phosphate, 1 cwt. per acre ..	18·83	4·57	11·70
10	Super., 1 cwt.	30·00	6·57	18·28
11	" 1 cwt., + nitrate of soda, 40 lbs.; sulph. of potash, 40 lbs. ..	30·00	6·10	18·05
12	" ½ cwt., + Thomas' phosphate, ½ cwt.	27·66	6·40	17·03
13	" 1 cwt., + nitrate of soda, 40 lbs., top-dressing in spring	34·33	7·14	20 74
14	Farmyard manure, 10 tons	24·83	4·38	14·60

Sown with Federation at rate of 75 lbs. per acre under equal conditions.

It will be noticed that two plots are left unmanured. These act as check plots, and enable comparative results to be made.

Owing to the dry autumn of 1912, there was no germination of weeds on the fallows before sowing time, so that the wild oats, which are very prevalent in the district, germinated at the same time as the wheat, and a rather dirty crop resulted. Consequently, the yields of several plots (more badly affected than others) were considerably reduced.

In 1913 the season was a good one, and the natural conditions throughout the experiment were similar.

Owing to the severe drought during the past season (1914) the yields obtained are very low.

The noticeable features of those plots manured with superphosphate have been (1) that the germination is a little quicker than on those plots not manured with superphosphate; (2) a quicker growth in the earlier stages (thus enabling the crop to get a better control over weeds); (3) a taller growth; (4) earliness in ripening (these plots ripening from two or three days earlier than the plots receiving no superphosphate);

and (5) the crop presents a much brighter green colour, and has a much healthier appearance.

Plot 9 (Thomas' phosphate, 1 cwt. per acre) is very similar in appearance to the unmanured plots. Plots 5 and 6 (receiving dressings of lime) have, up to the present, not given results to justify its application.

Nitrate of soda (sown with superphosphate, 1 cwt.), has not shown any payable increase, but as a top dressing in spring (Plot 13) it has consistently given the highest yield. Farmyard manure (Plot 14) has been very similar to the unmanured plots.

It must be remembered that only after a trial extending over a number of years can any definite information be derived from these experiments, for owing to the variability of the seasons, some plots may be more favorably affected some years than others.

An important factor to be taken into consideration in the manuring of the wheat crops is the resulting effect of the manure on the pasture. It is known that heavy applications of superphosphate to the wheat crop have caused vigorous growth of the pasture following, and although the wheat yields may not have justified such a heavy dressing, yet it has been amply repaid by the increase in the stock-carrying capacity of the pastures.

Seed Selection Tests.

The object of these tests is:—

1. To test the suitability of different varieties to local conditions.
2. To produce pure seed.
3. To improve the varieties by selection.
4. To institute a method of selection which is practicable on every wheat farm.

The system adopted with these plots is as follows:—Each plot is sown every year with selected seed, exactly the same weight of seed and manure being sown on each plot, and all are sown under similar conditions, receiving the same treatment throughout the year, so that as accurate a test as possible of the different varieties may be obtained. Before harvest each plot is carefully gone through, and a number of the best heads are selected from the best plants of each variety. Care must be taken in making the selections that the plants from which the heads are chosen have not had any advantage in environment, thus causing them to grow more vigorously than others.

The results that have been obtained at Longerenong during the last three years clearly demonstrate the advantage gained by this system of selection.

The following are the yields from Federation wheat, selected and unselected, sown in adjacent plots to determine the effects of selection:—

Federation.

1912.—Selected, 43.25 bushels; unselected, 34 bushels.
1913.—Selected, 36.2 bushels; unselected, 24.6 bushels.
1914.—Selected, 9.77 bushels; unselected, 5.73 bushels.

Varieties that have been included in these tests are given with the yields in the table below. Those varieties unsuitable to the district have been rejected and replaced by other varieties:—

SEED SELECTION TESTS. (LONGERENONG).

Plot.	Variety.	Yield per Acre.
		Bushels.
	1912.	
1	Kubanka	29·0
2	Turkey Red	30·75
3	Marshall's No. 3	32·75
4	Huguenot	12·75
5	American 8	27·75
6	Federation (selected)	43·25
7	Zealand Blue	24·00
8	Dart's Imperial	28·43
9	Crossbred 28	20·93
10	Currawa	34·93
11	Bayah	32·12
12	Federation (ordinary)	34·5
13	Commonwealth	30·5
14	Gluyas	32·93
15	King's Early	34·25
	1913.	
1	Federation (selected)	36·29
2	King's Early	31·35
3	American 8	29·39
4	Huguenot	16·52
5	Yandilla King	24·91
6	Gluyas	24·68
7	Dart's Imperial	29·99
8	Zealand Blue	27·55
9	Federation (ordinary)	24·66
	1914.	
1	Federation (selected)	17·23
2	American 8	11·92
3	Dart's Imperial	11·92
4	Marshall's No. 3	12·35
5	Commonwealth	12·35
6	Currawa	11·49
7	Bayah	7·59
8	Federation (selected)	9·77
9	Viking	7·47
10	Bunyip	4·59
11	College Eclipse	12·21
12	Gluyas	9·48
13	King's Early	7·90
14	Yandilla King	7·04
15	Federation (ordinary)	5·03

No reliability can be placed on the yields of these plots for 1914. as owing to the dry season some of the stud cereal and crossbred plots, especially the late sown plots, had to be irrigated to insure preservation

of the seed, and the irrigation water accidentally flowed over portion of the first six selection plots. Comparisons were made, however, on the unirrigated portions of these plots, and notes on the drought-resisting qualities of these wheats will be given later.

RATE OF SEEDING TESTS.

This test includes six plots, in which rates of seed are sown varying from 30 lbs. to 120 lbs. per acre. In 1914 two series of these plots were sown, the first sown early in the season, and the second three weeks later. The yields from these plots are as follows:—

Plot.	Seed per Acre.	1913.	1914.	
			Early Sowing, 26th May.	Late Sowing, 25th June.
	lbs.	Bushels per Acre.	Bushels per Acre.	Bushels per Acre.
1	30	16·00	8·14	3·75
2	45	17·66	11·01	5·94
3	60	20·16	11·73	5·37
4	75	27·00	10·69	5·94
5	90	28·83	11·96	6·41
6	120	28·0	10·34	6·41

Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, giving a **Demonstration of the Advantages of Wheat Selection at Longerenong before Members of the Horsham Agricultural Society.**

In 1913 it was noticed that the lighter the rate of seeding the more wild oats appeared in the plots. Plots 5 and 6 were both clean, Plot 4 had wild oats growing thinly through it, while Plots 1, 2, and 3 became dirtier as the rate of seeding decreased.

In 1914 the development of the plants varied inversely to the rate of seeding. This was more marked in the earlier sowing. Plots 1

and 2 were very thin (Plot 1 being the thinner), but the plants were strong and healthy with large ears and plump grain; the straw of Plot 2 was slightly taller than that on Plot 1. Plot 3 was shorter in the straw than Plot 2, the heads were smaller, and the crop much thicker. The same conditions continued in Plots 4 and 5, the straw becoming shorter with the increased seeding, and consequent increase in the thickness of the crop. The heads also became shorter, and the grain less plump. Plots 5 and 6 were very similar to each other, both being very thick, very short in the straw, and possessing very small, poorly-developed heads.

Graded Seed Tests.

The practice of grading the wheat for seed is becoming deservedly popular throughout Australia, for not only does an increased yield result, but all the rubbish, cracked grain, and seed of weeds are taken out by the process, which otherwise would be sown in the field. In 1914 the first graded seed tests were carried out here under field conditions, but owing to the drought the season was a bad one for tests of this nature; but experiments conducted in other parts of the State of late years show that graded seed yielded up to 2½ bushels more per acre than ungraded seed. A farmer can get his seed wheat graded at a price of from 6d. per bushel, so that, with an extra expenditure of from 7d. to 8d. per acre, an increased return from 4s. to 7s. would result.

Trial of Barleys.

In 1912 only four Cape barleys were sown, but in 1913 eleven varieties were tested, of which three were rejected in 1914, and the test now includes eight plots, in which four Cape and four malting barleys are being tested from year to year.

Why barley is not grown more largely in the district is curious, for the excellent returns from these plots should justify its cultivation.

In 1913, 80 bushels per acre were obtained from Roseworthy Oregon (6-rowed barley), and the highest yield from the malting barleys was from Gisborne, which yielded 60.2 bushels per acre.

As seen in the table below, all the barleys did well for this season, but Skinless, Goldthorpe, and Golden Grain were rejected owing to their unsuitability to the district—the former being very weak in the straw, while the two latter were unable to stand the winds prevalent here at harvest time, and shelled badly.

In 1914 the barleys were not sown till the latter end of June, and then an extremely small amount of rain fell during their growing period. However, Pryor (malting) proved itself drought-resistant to a very high degree, for although the straw was very short, it retained its fresh appearance right through the season, and produced a fine plump grain, yielding 10.45 bushels per acre. None of the other three malting barleys did well at all, being overcome through the dry conditions.

Roseworthy Squarehead yielded the highest of the Cape barleys, but these varieties were also severely affected by the lack of moisture, and ripened very unevenly, and were very patchy.

YIELD OF BARLEYS.

Variety.	Yield per Acre. 1912.	1913.	1914.
	Bushels.	Bushels.	Bushels.
Roseworthy Squarehead	44·1	68·8	8·36
" Oregon	35·2	80·2	6·54
" *Shorthead*	48·9	76·2	7·58
Pryor	35·25	44·2	10·45
Cape	..	74·0	7·32
Kinver	..	46·6	1·96
Archer	..	50·8	1·56
Gisborne	..	60·2	0·26
Skinless	..	8·0	..
Goldthorpe	..	43·2	..
Golden Grain	..	23·0	..

FORAGE PLOTS.

In 1914 the following plots were sown down for forage:—

1. Dun Peas.
2. Beerseem.
3. Sulla Clover.
4. Peas, Tick Beans, and Vetches.
5. Rye and Vetches.
6. Rape.
7. Kale.
8. Italian Rye Grass.

Heavy frosts in July and August killed the Beerseem and Sulla Clover, and retarded the growth of the Kale and Rape to such an extent that the plants remained small and stunted through the season. The combination of the frost and drought kept back the Rye Grass, and practically none reached maturity.

Plot 1. Dun Peas.—Yielded a crop of 2 tons 7.15 cwt. per acre.

Plot 4. Tick Beans, Peas, and Vetches.—Yielded 1 ton 15 cwt. per acre.

Plot 5. Rye and Vetches proved very hardy, and withstood well the adverse conditions of the season. The Rye reached an even height of 2 ft. 3 in., and yielded 3 tons 12.13 cwt. of fodder per acre.

PASTURE MANURIAL TRIALS.

In May, 1914, five plots of 1 acre each were laid out, and the pasture dressed with the following manures:—

Plot 1.—Superphosphate, 1 cwt. per acre.
Plot 2.—No manure.
Plot 3.—Thomas' phosphate, 2 cwt. per acre.
Plot 4.—Superphosphate, 2 cwt. per acre.
Plot 5.—Superphosphate, 2 cwt. per acre + nitrate of soda, 1 cwt. per acre.

This experiment has been carried out at the Rutherglen Experiment Station, with the result that the increase in the pasture and the vigorous growth of clovers over the heavily manured plots increased the stock-carrying capacity of the land to such an extent that handsome profits would result.

No results could be obtained from these plots at Longerenong this season, as all the grass dried off early in the season through drought conditions; but it is intended that these tests be continued for a number of years, so that the effects of the various dressings of manure on our local pasture can be fully determined.

The following summary of the notes taken on the behaviour of the varieties of wheat grown in the Seed Selection Tests under the drought conditions existing throughout 1914 may be of interest:—

Federation was the first of the wheats to lose its green appearance, the lower flag all turning brown early in September, and only the higher foliage retaining a fresh green appearance.

Stud Cereal Plots, Longerenong Agricultural College.

It held over a great deal better than the majority of the other varieties, developed fair heads, which came well out of the shot blade, was only slightly tipped, and yielded a fairly plump sample of grain, and gave the highest yield in the seed production plots.

Yandilla King.—Owing to the dark-green foliage of this variety it seemed better able to keep its colour than earlier varieties, which, as a rule, have a lighter green colour. This wheat retained its dark-green appearance right up to heading time, when the heads came well out of the sheath, but were rather badly tipped. The sample of grain was a fair one.

King's Early and Gluyas.—Both these varieties held out well, and were very similar in growth throughout the season. The straw was

short and the heads small, but well filled, and yielded a fair sample of grain They both showed their ability to mature a good sample, and produce a light crop under very severe drought conditions.

Bunyip.—This variety continued growing, though slowly, through the season till heading time, when it appeared to collapse, and gave the impression that in trying to grow normally under the severe conditions became exhausted. It yielded the poorest of all, and the extreme weakness of the straw this season was very marked.

Bayah.—This variety was also very badly affected: the heads small, and badly tipped, just showing above the sheath. All through the season it presented a very dry and sickly appearance.

Currawa.—This variety was one of the best drought resisters undergoing trial, always appearing fresh, and headed well. It yielded a fair return of grain.

Commonwealth.—Was very similar to Bayah in its behaviour, and its yield was chiefly due to the water the plot received.

Marshall's No. 3 and Dart's Imperial.—These two varieties showed up very poorly. Throughout the season they had a hard, dry appearance, and at heading time practically all their flag had withered. The heads were very poorly developed and very badly tipped. The majority never got clear of the sheath. In many cases not more than 4 to 6 grains were found in the heads. These plots received a considerable amount of water, thus causing the comparatively high yield shown in the table.

American 8.—This variety with its slender straw and scanty flag is likely to prove of value as a drought resister. It did comparatively well this year; the heads, though small, were not tipped, and the sample of grain was good.

College Eclipse.—This wheat showed itself to contain true drought-resistant qualities. It continued growing naturally, though slowly, right through the season; headed and ripened naturally. The heads were well away from the sheath, and were comparatively well developed, while the sample of grain was good and the yield very satisfactory. It grew to a height of 2 feet, and proved itself, at least for this season, to be the best drought resister undergoing trial at Longerenong.

GAIN IN WEIGHT.

An experiment carried ou under Government auspices showed that in 40 days' storage at New Orleans, a 24-lb. sack of flour, which had 12.37 per cent. of moisture on 3rd September, had increased to 13.84 per cent. of moisture by 13th October. The atmosphere was humid during the time of the experiment, and the moisture content of the flour varied with the condition of the atmosphere. The moisture content of the flour was rather high to start with.

In all probability a drier flour would have shown a much larger net gain in moisture in the time of trial.—*Milling*, 21st November, 1914.

The Use, Construction, and Cost of Concrete Channels and Underground Pipe Lines in Orchard Irrigation.

By S. A. Cock, Orchard Supervisor and Irrigationist, Bendigo and Northern District.

Since the publication of the articles on "Citrus Culture in Victoria" in the *Journal of Agriculture, Victoria*, March to December, 1913, it has been found necessary to add the following to Part VI., September, 1913, pages 535-541, "Irrigation, Cultivation, and Drainage."

In the sandy Mallee soils, and the pine ridge country of the Rochester, Tongala, and Cohuna areas, seepage is prevalent, and the attendant results very often injurious to citrus and other plantations.

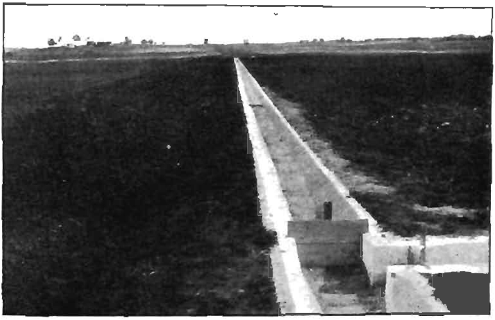


Plate 36.—Concrete Channels, Nyah, Showing Outlets, Gates, and Checks.

In all seepage areas the main distributary channels should be concreted to safeguard the adjoining land. The land-holder could then, by the use of concrete channels in place of delver drains, reduce the danger of seepage to a minimum. Plate 36 shows concrete channels as laid down at Nyah and Mildura. The usual measurements of the channels are 28 inches across the top, 10 inches across the bottom, and 6 inches deep, inside measurement. Width of sill at surface level 2½ inches; thickness of concrete, 1½ inches.

These channels are made of one in six cement concrete, using sand only with the cement, or they are made of one part cement, two parts sand, and three parts lime or stone rubble.

Channels are also made of lime concrete, using one part lime, three parts sand, and five parts lime or stone rubble.

At the bottom of the channel, outlets made of 2-inch galvanized iron piping are inserted. These outlets have a gate inside the channel; the

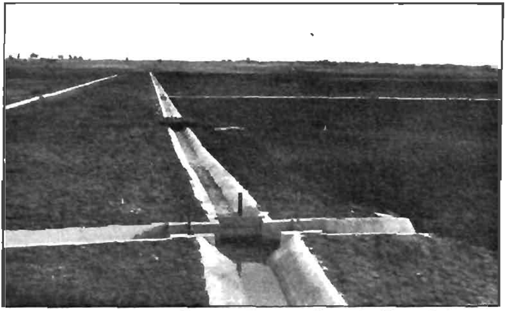


Plate 37.—Orchard Surface, Showing Concrete Channels, Planned for 5-chain Furrows.

Plate 38.—Pipe Line and Stands. Pipe System of Irrigation, Nyah.

gate works in a slot cut in the pipe, and the pipe or outlet should be sufficiently long to bring the water well away from the channel about

24 inches. The outlets are placed at every main furrow according to the distances the rows of trees stand apart. Checks are placed wherever

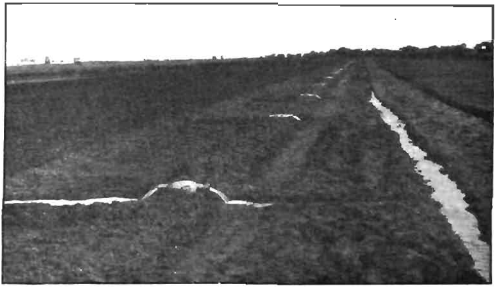


Plate 39.—Pipe System of Irrigation, Nyah, Showing Outlets and Gates.

required in the channel as shown, and are fixed in slots made in the channel at intervals necessary to keep the water at a height sufficient

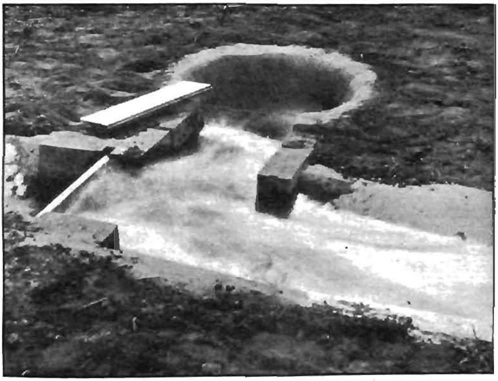


Plate 40.—Inlet for Pipe System of Irrigation, Nyah, Showing Checks and Wire Screen.

to fill any given number of outlets, according to the incline of the channel.

The cost of making these channels, as illustrated and explained, is approximately from £2 10s. to £3 per chain. Care is necessary in the bedding of the outlets, and in the proper mixing and laying of the concrete. The upkeep of the channels is very trifling in cost, but they require to be washed at intervals with lime or cement. Plate 37 shows part of an orchard at Nyah planned for irrigation on a five-chain length of furrow, the two parallel channels in the centre and left representing the main drive-way. On this property £500 has been spent on open concrete channels for the prevention of seepage.

On long slopes and undulating surfaces the underground pipe system is used in place of concrete channels. Plate 38 shows a section of these pipes; they are bedded 18 inches deep, and every 22 feet, or the distance the rows of trees are apart, a [redacted] length of pipe is inserted in the pipe line, and a stand brought to and above the surface 6 inches. Across the opening of the stand pipe, and at right angles to the pipe line, a piece of 2-inch galvanized iron pipe, 18 inches or 24 inches long, is laid, and immediately on the under surface of the iron pipe, at its centre, a Λ piece is cut out for the ingress of water, and gates fixed in slots at both outlets as shown. This piping and opening of stand-pipe is now domed over with concrete, and made water-tight. Plate 39 shows stand-pipes, outlets, and gates raised for irrigation, and Plate 40 shows inlet to pipe line from open concrete channel, with wire screen to arrest ingress of *débris*, and checks to alter flow of water from inlet to open channel, or *vice versâ*. The inlet is situated on the highest eminence commanded by the gravitation channel, and the water rises to the same height anywhere on the pipe line, on the principle of a syphon.

At the lowest elevation of a pipe line a concrete well is formed for the deposition of *débris*; this is kept water-tight by a felt-lined cover-board, or movable concrete cap, securely fixed by screws or bolts, so as to permit the removal of *débris* and flushing of pipe line. The pipes generally used for this system of irrigation are 6-inch glazed earthenware. Using what are termed as pottery seconds, the cost per chain for pipes, outlets, and labour should not exceed £2 10s. per chain.

This system could be applied to any surface, doing away with open channels altogether, and is suited either to gravitation or power. It may be worked by any size or variety of water-tight pipe, always taking into consideration the pressure of water from power or gravitation.

On very steep inclines, and where power is used to supply water, the "Numan" spray system, or over-ground piping, is sometimes used. It does not promise to become popular on large areas, but may be recommended on small areas of uneven surfaces or steep inclines, where power only is used.

GUARANTEES FOR LIME.

The Staffordshire Chamber of Agriculture has called attention to the necessity for farmers getting a guarantee when buying lime. A case was instanced where a parcel of 20 tons of lime was purchased, and was found, on analysis, to be practically worthless for agricultural purposes. The county agricultural instructor expressed the opinion that farmers should not buy lime which contained less than 80 per cent. caustic lime.—*Fertilizers and Feeding Stuffs Press*, 21st November, 1914.

BEE-KEEPING.

By F. R. Beuhne.

FEEDING BEES

Feeding bees is carried out in Europe and North America to a far greater extent than in Australia, where nature nearly always provides the necessary supplies: only twice has it been necessary to supply the bees with artificial winter stores in the writer's twenty-seven years of bee-keeping.

Feeding is done for three distinct purposes. (1) To stimulate brood-rearing, (2) to tide over a period of dearth during the working season, and (3) to supply the colonies with winter stores.

Stimulative Feeding.

This is practised in Europe and very extensively in the United States of America. The object is to have a stronger force of worker bees in the hives by the time an early honey flow is expected than could possibly be present if the colonies were left to develop naturally under the influence of the gradually rising temperatures of spring. The feeding in this instance consists in giving each colony daily a small amount of sugar syrup of equal weights of sugar and water, given blood-warm in a feeder inside the hive, preferably towards evening. Feeding should commence five to six weeks before the honey flow, so that most of the bees raised will be of field age when the expected flow is at its best.

In Victoria, in normal seasons, there is sufficient natural stimulation early enough in spring to fully develop the strength of the colonies for the main honey flow without resorting to artificial stimulation if the bees are favorably located during the winter and early spring. In localities where an early honey flow occurs it may, however, yet be found that stimulation feeding, judiciously done, would be very profitable.

Starvation Feeding.

This is done to tide the bees over a period of complete dearth of nectar such as sometimes occurs even in midsummer, caused by a break in the succession of flowering eucalyptus, or by a spell of cold weather extending over many days. Under these conditions bees will cease breeding altogether, and may even throw out all young brood unless promptly given food.

The generations of bees missed through a stoppage of brood-rearing or destroyed for lack of stores will be badly missed in a honey flow a month later. The remedy is to give each colony one comb of honey if such has been kept on hand for such an emergency: if not, to give each a dose of sugar syrup, ½ pint to 1 pint, according to the strength of the stock

FEEDING FOR WINTER STORES.

As indicated before, it does not often become necessary to supply artificially the amount of stores of honey necessary to safely bring the colonies through the winter and ensure their normal development in spring. The wintering problem as found in most parts of the northern hemisphere does not exist here; still, a certain amount of attention is required at the end of the season, which, unfortunately, is too often not given, with the result that, although the bees in most instances struggle through somehow, the development of the colonies in the following spring is greatly retarded and interfered with, by the absence of sufficient good stores, by too much space and the scattering of the stores (often of watery honey) in too many combs.

The ideal condition for winter is to have each colony in a single story, on just as many combs as the bees can cover, and these combs well filled with sealed honey or syrup. In seasons when the honey flow declines gradually, this condition is obtained by taking all supers off before the flow is quite over, when the usually thin nectar will be stored in the combs covered by the bees, and there ripened and sealed, instead of in the super combs, where it would candy or sour during winter, and causing, when consumed later on, dysentery amongst the bees.

When the honey flow ceases suddenly, the brood combs will often be found with much brood but very little honey when the supers are removed. It then becomes necessary to supply the bees with sufficient good winter food to carry them through till spring. The amount will vary, according to the strength of the colony, from 20 to 40 lbs. of sealed honey or syrup.

If the apiary has been free from foul brood for several seasons, any thin honey found in the combs of the supers which were taken off may be extracted, and, after being heated to 170 deg. Fahr., fed back to the colonies till each has enough. Colonies below the average strength, which cannot properly ripen any honey or syrup given them, it is best not to feed, but to supply them with stored and sealed or partly sealed combs from stronger colonies abundantly fed. If there is suspicion that foul-brood germs may be present in any of the combs, it will be best not to feed back any of the honey extracted, but to give instead a syrup made by dissolving 2 parts of 1A sugar in 1 part (by weight) of boiling water. Even with sugar at 17s. 6d. a bag, sugar syrup is cheaper than and just as good as honey of the same density, while all risk of infection is avoided.

Feeding for winter stores should be done rapidly, and while the weather is still fairly warm. The syrup (or thin honey) should be given blood-warm, and of the density given above (2 lbs. of best sugar to 1 lb. boiling water). All feeding should be done inside the hive, with the twofold object of keeping the food warm as long as possible and of preventing the access of bees from other hives.

As feeding for winter stores is so seldom required, there are perhaps few apiaries in which the necessary feeders are on hand. To make sufficient feeders for a fair-sized apiary would take some time and considerable material, and on this account the bees are sometimes left to take their chance at times when prompt feeding at the right time would insure their safe wintering, and a vastly greater honey crop in the following season.

The Simplicity feeder, as sold by supply dealers (Fig. 1), while quite suitable for stimulative feeding, is altogether too small for feeding winter stores. The frame-feeder (Fig. 2), while still somewhat on

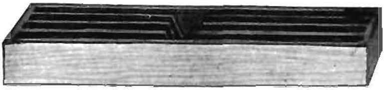


Fig. 1.—Simplicity Feeder.

the small side, is more suitable, but rather expensive. The writer, when suddenly confronted with the problem of feeding a large number

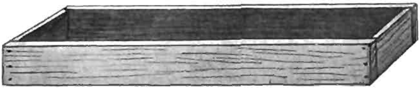


Fig. 2.—Frame Feeder.

of colonies heavily in a short space of time, used 7-lb. honey tins for this purpose. All that is necessary is to have for each tin a piece of

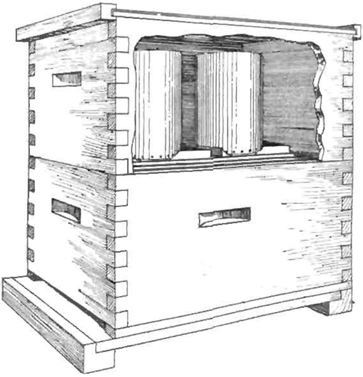


Fig. 3.—Inverted Honey Tin Feeders on Hive.

thin board 6 inches by 6 inches, to which is nailed a rim ⅜ inch thick and ½ inch deep, with hot wax run all over joints to make them watertight. The lever tops are removed from the tins; if the tins have

wire handles, these are pulled out, and the clips holding them bent down so that the tin will stand level when upside down. A few holes are punched into the side of the tin with a 1-inch nail, as near the top edge as possible. The tin is then filled with syrup, the rimmed board put on top (rim downward), and, while holding the tin from the bottom with one hand and pressing the board on tightly with the other, the tin is swiftly turned upside down and stood on a level surface. The little shallow trough formed by the board will be full of syrup up to the top of the holes punched into the tin. When placed on the top of the brood frames, as shown in the illustration (Fig. 3), as the bees sip up the syrup more will ooze out, till the tin is empty. Of course, the top of the brood frames should be level in all directions, otherwise all the syrup will run out if the inverted tin stands very unevenly.

A super from which a sufficient number (or all) of the frames have been removed is put over the tin or tins, and the hive cover on top. Several tins, sufficient to supply the needs of the colony, can be put on at the one time, and any kind of round tin can be used, washed out afterwards, the fine holes closed with solder, and the tins used for packing honey. Square or flat tins are not suitable, as the sides give way inward, and allow too much syrup to escape.

WHEAT-GROWING AT MITTA MITTA.

Details of interesting tests with wheat have come to hand from Mitta Mitta.

Mr. John Courtney, of Mitta Mitta, obtained five varieties of wheat—Bayah, Genoa, Zealand Blue, American No. 8, and Marshall's No. 3—from the Rutherglen Experiment Farm in 1913. He sowed them on chocolate loam soil in 1913, and obtained the following results:—

> Marshall's No. 3.—22½ bushels per acre.
> American No. 8.—20¼ bushels per acre.
> Zealand Blue.—16¾ bushels per acre.
> Bayah.—13½ bushels per acre.
> Genoa.—10½ bushels per acre.

Federation wheat had been tried in previous years in the district but without success. Of these five varieties, Marshall's No. 3 and American No. 8 gave the best returns. Fully a bag to the acre of American No. 8 was lost owing to the tough heads and the difficulty of stripping this variety. Mr. Courtney decided to sow Marshall's No. 3 in 1914 on a larger area, and accordingly prepared 60 acres of land, of which 20 acres was sown at the end of May, and 40 acres during the first week of July. The early-sown crop averaged 30 bushels per acre, and the late sown 21 bushels per acre. The crop was harvested with a combined harvester. The seeding allowance was 1½ bushels per acre, and the manure allowance 1½ cwt. of phosphate per acre. The farm is 37 miles from Tallangatta, the nearest railway station, and the carting cost 6d. per bushel.

THE OLIVE.

L. Macdonald, F.R.H.S., Horticulturist, Agricultural College, Dookie.

(Continued from page 160.)

Varieties—*continued.*

The following varieties comprise the great majority, if not all, of those found growing in the Commonwealth. A few kinds new to our conditions are being introduced from year to year but many of these have not fruited yet. It is probable, however, that some of them may be valuable for further planting. Many seedlings are found growing in different places some showing great promise both as picklers and oil olives, but their special qualities have not been sufficiently established, either by accurate laboratory testing or commercial experience, to warrant extensive planting. However, it is sufficiently demonstrated by the great range of forms and the apparent quality of many of the seedlings here that our conditions seem to favour the production of new kinds of outstanding merit; and there is good reason to believe that, with careful selection and testing, we may be able to originate kinds in advance of those growing elsewhere.

The identity of the varieties known as "Silver Eye" and "Bird's Eye," which may be identical with "Hare's Eye" or (Ojillo de Liebre or Ojo de Liebre), and "Black Italian," and "Large Fruiting," &c., appears to be somewhat obscure. Although some of them seem to hold their popularity with certain growers, it is considered inadvisable to advocate them for more general planting until their position as economic kinds is more clearly defined.

Correggiola—*Syn.*, *Grossago*, *Frantajo.*—An Italian variety, barely medium size, obovate in shape, a good grower and cropper, ripens rather unevenly throughout tree, hangs well. Makes a good-quality oil in great abundance. An high-class oil variety, and strongly recommended for planting for that purpose.

Common or Broad-leaved Mission.—Believed to be identical with Cornicabra variety of Spain. There appears to be several kinds of Mission olives, but it is the Common or Broad-leaved Mission olives that are so largely cultivated for their oil. The original trees of this variety were found growing at the old mission stations at San Diego, in Lower California. As these trees are believed to have been introduced by the Jesuit monks from Europe, it is more than likely that this kind is known under other names in some places bordering the Mediterranean. Some writers claim that it is identical with Olivier de Grasse, Plant de Salon, Tabasquo, &c., while others believe it to be also known as Rostrata, Rapanier, Cornaud, Corniale, Picudo, Tetudillo, Picual, &c. However, it appears to be fairly certain, by the evidence before me, that a number of these names at least are applied to other varieties differing in many respects from the Mission, and cannot be accurately applied to that kind. As this kind has gained its fame chiefly through its popularity in American cultivation, the name used in that country appears to have the greatest claim for adoption here.

Tree vigorous, upright grower, and good cropper. The leaves are dark-green with well-marked veins, underside very whitish. Fruit is large, and turns black when fully ripe. This variety is noted as one of the very best, if not the best olive known to American cultivation, according to reports it is uniformly prolific in varying situations. It produces a first class oil in abundant quantities, and is also a first class pickler. The only disadvantage with this kind as an oil olive is the somewhat irregular ripening of its fruit. Consequently, to get the best results, the trees have to be picked over more than once Highly recommended *for commercial planting.*

Herbequina—Syn., Arbequina (Salerno (?)).—This variety was introduced here from Cataluña, in Spain, by Mr. F. de Castella. He informs me that it is most esteemed in that country for quality and fruitfulness, and was strongly recommended as an oil olive. It does not appear to have any synonym by which it is known to other countries, and is not even mentioned by many of the best known writers

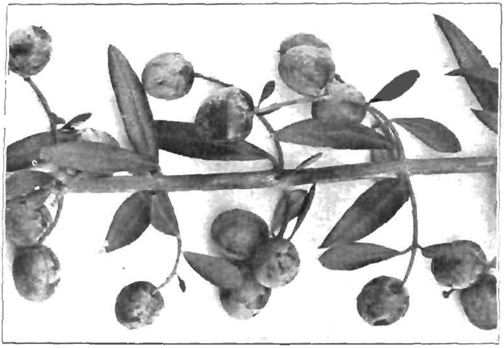


Fig. 30.—Herbequina Olive.

on the subject. The test (24.80) per cent. of oil from the whole olives, and 45.10 per cent. on the dry basis) obtained by Mr. Scott, Chemist for Agriculture, from some of the whole fruits, the first produced here, is promising, and it may prove a valuable sort for planting. However, further tests must be made to establish this. The tree is a good and shapely grower, carrying an abundance of laterals on the main branches, which tend to come into fruit early. *Ripens about 17th of May.* Fruit medium size, obovate, full at base and bosom, tapering quickly to apex, borne solitary or in twos, threes, or fours on short pedicles from long peduncle: pale-green with white dots, changing slowly and in patches to violet, and when fully ripe violet-black with white dots, hangs well. Unsuitable for pickles, but a promising oil variety. Insufficiently tested here yet.

Pleureur.—Introduced into South Australia, and probably confounded in some of the groves with Bouquettier, which is responsible for the high reputation of the latter in some instances. (*Believed to be identical with Olivier de Grasse, Plant de Salon, Cougniale, Tabasquo, Olivier a fruit de cornouller, O. europea cranimorpha medio fructu cornu of (Gouan), L'olea corniola of (Risso), L. olivier Pendulier of (Riondet*). Tree fairly good grower and good cropper; leaves rather long, narrow, shapely, short petiole; fruit medium size, roundish oval, borne in twos and threes chiefly on short pedicles on medium peduncle; hangs well and ripens rather unevenly. This variety is unsuitable for pickling on account of size, but is strongly recommended for planting as an oil olive.

Picholine—*Syn. Pijouline, Picholin, Saurine, Corrias, Collias, Colasse, Sausen, Saugen, Saugin, Saurenque, Plant de Saurin, Surine punchudo, Pignotte, Piquette, Lechin, Pignola, Acquillo, Lucques batarde, O. ovalis, O. europea saurina, O. europea oblongo, O. frustu oblonga minore, O. minor oblonga.*

Tree medium grower, fairly good and regular bearer, leaves long and narrow, inclined to recurve. Fruit long and curved, with stone of characteristic shape. Highly esteemed as a pickling variety in France owing to its fine quality as green pickles; also makes a good oil, but not in such abundant quantities as some other kinds.

Manzanillo—*Syn., Pomiformis, Ampoullier, O spherica.*—Also said to be identical with the French Redonal, but not clearly established as such. Tree moderate grower; good bearer; fruit borne mostly solitary on long peduncle, running to good size under irrigation, early This variety has gained a great reputation in Spain and America as a pickling olive, whether green or ripe, being of fine rich quality and losing its bitterness early. It is also valued for its oil. Strongly recommended for planting in the irrigation districts where pickling is in view.

Attica.—A variety not much grown, although rather good oil producer, about in the same class as Verdale as an oil olive, but said to produce a better quality oil.

Bouteillan—*Syn., Racimal, Boutiniere, Ribieu, Rapugette.*—Tree fairly good grower and cropper; said to be resistant to cold, and capable of doing well in poor soils. Fruit medium size, ripens somewhat unevenly, hangs well, unsuitable for pickles, but a useful kind for oil production.

Pigale—*Syn. Piqoou, Picatado, Pognue, Pigau, Marbree, O. variegata, O. pignola, Tondolina*—Tree said to be a tall upright grower, doing well in poor soils. Fruit medium to above average size, mostly produced singly, oblong, deep-black when ripe, with white dots. A popular French variety, making a good oil, and in good quantities.

Dr. Fiaschi.—Small olive, unsuitable for pickling owing to size, but a useful variety for oil, although not regarded as first class.

Gros Redondau—*Syn., Gros Redona, Grosse Redouau.*—Tree a good grower, but shy though regular bearer. Fruit medium to large in good situations. May be used for pickling, but not recommended as an oil variety.

Arecluzzo.—Tree said to be a good grower. Fruit roundish ovate, medium size, borne in numbers on long pedicles with short peduncle; not recommended as a commercial variety for oil or pickles.

Atro-Rubens—*Syn., Saillerne, Sagerne, Saverne, Salierne, O. rubro nigricans.*—Vigorous spreading tree and good cropper, rather susceptible to cold. Fruit rather small, deep-black, drooping, borne on long peduncle. Produces oil of good quality, but not in sufficiently large quantiti s to warrant planting for that purpose, unsuitable for pickles.

Macrocarpa.—Tree rather poor grower, and moderate to shy bearer. The fruit is very large and pointed; makes fairly good pickles, but of little use for oil.

Ammelau—*Syn., Ammelau, Amandier, Amellou, Morcal, Madrileno, Maxima, O. amygdalina.*—Tree generally said to be weak grower, and not a good cropper. Fruit large, suitable for pickles, but a poor oil producer.

Salonica.—Tree considered to be only moderate grower, and shy bearer. Fruit medium size, roundish ovate,* not regarded as a good kind commercially for either oil or pickles.

Columella—*Syn., Loaime, Pasala, Columballa, Colambella.*—A very ancient kind. Free vigorous grower and good cropper. Fruit oval, of good and even size, borne in numbers generally on short pedicles. A thrifty kind, doing well in poor situations, but not regarded as a high-class kind for either oil or pickles, although, according to some American tests, a yield of 39 gallons to the ton of olives has been obtained.

Regati.—Tree moderate grower, with dense foliage and broad leaves, short petiole. Fruit roundish oval, below medium size. Insufficiently known to warrant recommending for planting for either oil or pickles.

Ragiola.—Tree said to be a moderate cropper. Fruit medium size, oblong oval in shape. Unsuitable variety for planting, either for oil or pickles, owing to poor oil content and lack of size.

Oblonga.—A variety about whose identity there appears to be a considerable amount of uncertainty. This kind was referred to before among those introduced to Dookie Agricultural College. It is found, however, that it differs from the Oblonga introduced into New South Wales. The name is one of the many adopted as a synonym for Picholine. The Racini or Radinoppe was introduced into California as Oblonga. But subsequently it appears that a variety under the name of Oblonga was introduced which differed in many respects from those previously mentioned. The kind introduced under this name to Dookie appears to possess many of the true characteristics of the Picholine.

Pendulina.—Tree moderate grower and good bearer. Fruit oval, generally medium, but variable in size: parts with its bitterness early, borne in numbers. This variety must not be confounded with Pendoulier, which was mentioned before in respect to Salouen, but is more generally known under the name of Corniale, a variety that has some value as a pickling olive, but not much esteemed for its recoverable oil content, although giving some excellent tests in Arizona, U.S.A.*

Belle di Spagna—*Syn., Belle d'Espagne.*—Fairly prolific kind, of medium size, but poor in oil content; not recommended for planting.

Columbaro.—Tree said to be fairly good grower and bearer. Fruit medium size, oblong, even shape. A variety of not sufficiently outstanding merit to warrant planting.

Cucco.—Medium to small olive, fairly good grower and cropper, varying somewhat in different soils. This variety has shown very high

* Bulletin 62. University of Arizona Agric. Ex. Station.

oil tests in California, but they are not supported by experiences here, nor yet does it appear to have gained any great popularity as an oil olive elsewhere. Unsuitable for pickles.

Lucca *Syn., Lucques, Lucquoise, Oliverolle, Odorante; also believed to be identical with O. e. ceretocarpa.*—Fairly vigorous tree, of medium duration: stands frost well. Does best in deep, light, hillside situations. Produces a good quality oil, but not in great abundance. Esteemed chiefly as a pickling olive.

McArthur's Seedling.—This is a locally-raised variety, produced by McArthur Brothers, but not of sufficiently outstanding merit to warrant recommending.

Hardy's Mammoth—Variety raised by Mr. Thomas Hardy, South Australia. Tree good grower and cropper. Fruit very large in size, producing a good quantity of oil, also possessing many of the features of a good pickler, for which purpose it is specially suited. A useful kind, that promises to be of value for further planting.

Navadillo Blanco—*Syn., Doncel, Moradillo, Olivio Lucio, Ojiblanco, Argentata, Moureau, O. precox.*—Tree an exceedingly vigorous grower, of robust constitution. Generally regarded as a good bearer in suitable districts, but variable and less productive in regions unsuited to it. Subject to frost injury. This variety was planted largely in California, but has been superseded of late years by more desirable kinds.

Tarascon.—A variety of little vogue, being only of moderate value.

Sevillano—Syn., The Queen.—Believed by some writers to be identical with Regalis, Pruneau de Catignac, &c. An early Spanish sort, very large in size, bears mostly solitary. A popular kind for green commercial pickles, although somewhat coarse in quality. Clingstone, firm-fleshed, stands transport well. Some of this kind, with the Manzanillo variety, were recently introduced into this State from California by Mr. Elwood Mead. Recommended for planting where pickling is in view; unsuitable for oil.

Ascolano—An Italian variety, from Umbria. Tree a vigorous grower and good cropper. Fruit of large size, and of excellent flavour; an excellent kind for pickling, although bruising somewhat easily in transport, and not so suitable for long-distance transport as some other kinds; also does not colour well.

Rouget.—*Syn., Rougette, Marveilletto, Vermillau, Pigau, Laure, Caillose, Cayonne, Rousseoun, Rougeotte, O. rubicans, Rouget Cayonere.*—Tree hardy, erect, rapid grower, with large short leaves petiole short and thick. Fruit red, medium size, borne two, three, or four together on long peduncle. Bears well, but not regarded as an high-class variety for either oil or pickles.

Oliviere—*Syn., Oulivieere, Oulliviere, Oullevieira, Pointue, Pounchudo-barralenquo, Gallinenque, Atro-virens, Galinenquo, Liviere, Laurine, Michelenque, Bouteyenque, O. e. laurifolia, O. e. medio oblonga angulosa, O. e. fructu majusculo et oblonga.*—Hardy, vigorous tree, of great branching habit; long lived; does well in rich soil, bearing well nearly every year. Not suited for poor soils or dry situations, as it deteriorates greatly. Quality of oil varies much in different soils. Ripens in mid-season.

Oblitza.—Large roundish oval variety, resembling Pendoulier; tree generally good grower, hardy and productive, especially suited for pickling.

Razzo—*Syn., Frantojano.*—An olive that is grown largely in the regions of Tuscany and Lake Garda, Italy, and in the district of Lucca, where it is highly esteemed for its oil. Regarded as one of the very best oil producers in Italy. This reputation also appears to be supported by American experience. A prolific vigorous kind that seems to be well worthy of extensive planting, but as yet untried here.

Argentale—*Syn., Luzen, Veral Blanco, Blankette.*—A very large tree, of spreading habit; early. Oil said to be of good quality, but poor bearer.

Tagliasco.—Italian variety, known in France as Caillet or Cailletier.

Carrasqueno—*Syn., Redondillo, Redouan de Cotignat.*—Early Spanish sort, of not outstanding merit.

Gordal—*Syn., Ocal, Olivo real, Hispalensis; probably same as Grosal.*—Large early Spanish variety, largely used for pickles.

Veral-negro—*Syn., Alameno.*—Appears to be identical with the French Callet Rouge, Tiganier, &c. Tree does not attain large size; bears freely and regularly. Fruit reddish, oval, of medium size. Makes a good quality oil, but not in large enough quantities.

Navidillo Negro.—A hardy Spanish variety, said to be prolific, and produce a good-quality oil. Late.

Javaluno.—A Spanish variety, said to produce large oval fruits. Ripens late; believed to produce good-quality oil, but more suited for pickling.

Bellotudo—Syn., Villotudo.—Early Spanish sort, said to be a large and luxuriant grower, but small bearer. Gives a good-quality oil, and matures early.

Empeltre.—Early Spanish sort, said to be small-growing tree, but very hardy, not susceptible to cold. A prolific bearer, producing a good oil.

Colchoundo.—A Spanish variety, said to produce large red roundish fruit about 1 inch long. Early, prolific, yielding a good quality of oil.

Lecciono—*Syn., Leccio, Lecinio.*—One of the most ancient varieties known. Believed to be the noted Licinian olive esteemed by Cato and his contemporaries. Remarkable for its great longevity and endurance to cold. The fruit, which is small, and produced in clusters, hangs well, and is borne in abundance. Said to produce a fine-quality oil in good quantities.

Puntarolo.—Said to be only moderate grower and poor oil-producer.

Mignolo—*Syn., Gremignolo.*—An Italian variety of great antiquity. Said to give abundant crops under conditions where many other varieties will not do at all. A free bloomer; the fruit is small, and hangs well Fruits every year. Considered of great value in appreciating the value of poor hillside lands.

Morajolo.—A variety that appears to be much esteemed in Tuscany owing to its hardihood and prolificacy. Said to produce a good-quality oil in large quantities. Used largely in the colder situations, and on poor lands.

Morinello.—Another variety said to be much esteemed in Tuscany owing to its prolificacy and hardihood.

Trillo.—Tree said to be medium size, with broad leaves; a free bloomer and good setter; hangs well.

Blanquettier d'Antibes.—Tree vigorous, erect grower, chiefly confined to the neighbourhood of Antibes. Subject to frost injury. Said to yield an excellent oil, of very pale colour, which is much used in perfumery.

Moriale—*Syn., Mourau, Moure, Mourescale, &c.*—Very large-growing tree, of spreading, almost weeping, habit. Regular bearer; very small early fruit: a variety that was much esteemed formerly.

(Other varieties, as Rose, Ribegro, Draguignan, Arabane, Dent de verrat, Trippue (Syn., Ventrue), although still retained in some places, are going out of date.)

Naturally there are a great number of varieties in Italy other than those referred to in the foregoing pages. The reports of the Agricultural Department list over 300 kinds, but there may be a considerable amount of duplication owing to the number of synonyms used in some cases. Professor Antonio Aloi gives the following list as comprising the most fruitful kinds, as well as those that yield the best oil. They are grouped according to the different regions of the country

Sicily.—Ogliaia, Cattabellottese, Biancolilla, Calamignana, Nebba, Cerasola.

Calabria.—Corniola, Camuguana, Ottobrarica, Coccitana, Mammolese, Varesano.

Puglia.—Paesano, Oglarolo, Monopolese, Cellina.

Abruzzi.—Corniola, Casertana, Noccia, Polyposa, Gentile.

The Marshes and Umbria.—Raia, Raggia, Corniola, Ascolona, Grassaia, Maglianese.

Tuscany.—Frantoia, Moraiola, Leccino, Correggiola, Razze, Marajole, Infrantoio.

Liguria.—Taggiasca, Pignola, Colombaia, Mortina.

Lake Garda.—Nostrano, Razzo, Gargna, Bomboletta, Favera.

Other Italian varieties belonging chiefly to Sicily, Tuscany, and Puglia are:—Calabrese, Patornese, Giarraffa, Pasole, Leccese, Siracusana, Pausio, Algiano, Sergio, Culuminio, Orchide, Regio, Coroite, Nerio, Mirteo, Biancolino, Pizzuto, Ferlese, Palazzuolo, Prunaro, and Dattio.

In compiling a census of the most desirable olives some years ago, Professor Caruso, of the National University of Pisa, separated the olives under these heads, viz., the domestic olive, the wild olive, and the seedling olive. He groups the olives of France, Spain, and Italy in the following manner, relative to their value as oil olives:—

—	Italy.	France.	Spain.
Group 1.—Oil Olives	Razzo	Olivier de Grasse	Cornicabra or Mission
	Trantojano ..	Pleureur ..	.. .. ..
	Grossajo	Pendoulier ..	.. .. ..
	Correggiola ..	Pendulina ..	Royal or Gordal
	Taggiasco	.. .. ..	.. .. ..
	Racemi or Racinoppe	.. .. ..	Racimal
Group 2.—Middle class Olives ..	Morinello	Mouraou ..	Navadillo Blanco
	Morajolo	Cayon de Marseille	Veral Negro
	Piquolo	Picholine ..	Lechin

Olives of Italy, France, and Spain—*continued.*

—	Italy.	France.	Spain.
Group 3.—Seedling Olives	Mignolo	.. .. ..	Manzanillo
	Germiquolo ..	.. .. ..	.. .. ..
	Leccino	.. .. ..	.. .. ..
	Leccio	Verdale	Empeltre
	Columbaro ..	.. .. ..	Verdejo
	Puntarolo	.. .. ..	.. .. ..
	Trillo	.. .. ..	.. .. ..
Group 4. — Wild Olives	Oleastro	.. .. ..	Acebnche

(*To be continued.*)

THOMAS' PHOSPHATE (BASIC SLAG).

"The lime contained in basic slag, *i.e.*, Thomas' or Star phosphate, is itself of considerable value; it supplies what is often a much-needed base, and on old grass land in particular, its effect in bringing the soil potash into solution, and in promoting the oxidation of the nitrogenous reserves in the soil is very marked; on tillage land also, the lime is of assistance in improving the texture of the soil."

—A. D. Hall, M.A., F.R.S., formerly Director, Rothamsted.

"In this country (England) there is rather a prejudice against the use of basic slag on the lighter soils—the sands and gravels, which are yet too poor in carbonate of lime, to be fitted for superphosphate.

They are generally regarded as too dry to allow the basic slag to be effective, but in view of the value that basic slag has been found to possess on the light sandy soils of Eastern Germany, where, too, the rainfall is less than that of England, the popular opinion seems to be founded on a misapprehension. It has probably arisen from the fact that on the poor, sandy grass pastures (where lacking the necessary potash), basic slag never (when applied by itself) shows the extraordinary effect it does on the poor clay pastures. This is due, not to the ineffectiveness of the phosphoric acid in the basic slag, but to the lack in the sandy soil of both potash and of humus to be set in action by the lime contributed by the basic slag. The great outburst of white clover, which often follows the application of basic slag to a clay pasture, is mainly promoted by the potash liberated from the soil. As a source of phosphoric acid for tillage land, basic slag is probably little less effective on a light than a heavy soil."

FEED AND COWS' MILK.

In his quarterly report upon the analysis of various samples taken under the Food and Drugs Act, Mr. Arthur Angell, public analyst of the Hants County Council, says that there appears to be a growing practice of feeding cows upon brewers' grain and oil cake, by which milk rich in fat and poor in other ingredients is produced.—*Fertilizers and Feeding Stuffs Press,* 21st November, 1914.

SEEDING NOTES.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

It is unfortunate that, coincident with the progress of the greatest war in history, the most severe drought on record should be afflicting Southern Australia. So far from being in a position to make a material contribution of grain for the Empire's needs, Australia will need to import wheat before the close of 1915 to supply local shortage. The effect of the drought has not only been felt on the wheat crop; equally serious has been its effects on grass, fodder crops, hay, water supplies, and water storage. Never has the wheat farmer been more anxious to see a decided break in the weather as in the past six months. With pastures denuded of grass, dams drying up, dwindling forage supplies, and drifting fallows, the task of the farmer has been anything but enviable.

Victoria has not suffered as badly as other States, for it has been possible to transfer the greater portion of the stock of the worst affected districts to the Western District and Gippsland, where, despite a shortage in the rainfall, grass has hitherto been plentiful. In this way loss of stock, which is the worst feature of droughts, has to a large extent been mitigated.

It seems fairly certain that the acreage sown this season will not be as large as was anticipated last harvest. The factors which are most likely to exercise a limiting effect on the acreage sown to wheat in the wheat belt will be shortage of grass and fodder, scarcity of water, and inability to effectively use the normal team strength for the preparation of the crop. At the present time (15th March), a large percentage of the horses of the Mallee, Wimmera, and Northern Districts are in Gippsland and the Western District on agistment. Of the number that remain on the wheat farms, many are engaged in carting fodder and water, whereas in a normal season they would be engaged in preparing the land for seeding. There seems good ground for believing from the many inquiries received by the Department that considerable areas of wheat will be sown this year in Gippsland, the North-Eastern Hill country and in parts of the Western District where hitherto wheat has not generally been grown. This is satisfactory, and if care be taken to secure varieties which are suitable to such districts, good returns may confidently be anticipated.

The abnormal prices ruling for hay and fodder, caused by the excessive demand from South Australia and North-Western Victoria, will debar many who are short of feed from putting in increased areas. Nevertheless, with a definite break in the weather, and good April rains, grass and herbage will spring up with remarkable rapidity, after the prolonged and enforced rest the land has had through the visitation of drought.

In view of the abnormal circumstances surrounding the present season, some observations on seeding practices should be of interest.

PROVISION FOR EARLY FORAGES.

In view of the bare condition of pastures, and the scarcity of feed in the wheat areas, opportunity should be taken to sow, as soon as possible,

and before the rain comes, small areas of Cape Barley, Algerian Oats, and Winter Rye for early green feed for the stock. In the better rainfall districts, sowings of rape, and rape and barley will give a profusion of feed soon after the first heavy downpour of rain.

Practically all the stock in the wheat areas are now being hand-fed at considerable expense, and a small expenditure on early-sown green forages will reduce working expenses, and the condition of the stock will be materially benefited.

ECONOMY OF SEED.

The figures published by the Prices of Goods Board giving the supplies of wheat on hand in Victoria on 25th February show that the quantity of wheat available for seed purposes is below probable seeding requirements. If a full acreage is to be seeded, therefore, it is very desirable that the greatest possible economy of seed should be effected, consistent, of course, with crop efficiency.

It is well, therefore, to consider, in view of the high price of seed wheat, and its general scarcity, whether smaller sowings per acre than are usual would be advisable, in view of present circumstances, and the nature of the past season.

Principles Governing Rate of Seeding.

In order to appreciate the problem and to find an answer, consider what are the factors which govern the amount of seed sown per acre. Briefly, we may say that the amount of seed required varies with the rainfall of the district, the time of sowing of the seed, the character of the seed bed, the class of wheat used for seed, and the depth and condition of the soil in which the seed is sown. Let us consider these various points, and then endeavour to see how we may adapt the principles involved to local practice. The lower the average rainfall the less seed is required. The minimum is therefore required in the Mallee, the maximum in the Western District, the North-East, and in Gippsland.

The time of sowing is important. Early-sown wheat requires far less seed than the same variety sown late. This has been demonstrated year after year in the results of experimental plots at experiment farms. Forty pounds of seed sown in April in a normal season will give as thick a crop as 60 to 70 lbs. of seed sown in June. That is one reason why as seeding progresses it is necessary to gradually increase the amount sown, since the late-sown wheat has much less opportunity to stool out and establish itself before the winter sets in than the early-sown wheat. Soil temperature is an important factor in determining the extent and nature of stooling. In April the moisture and warmth enables vigorous growth to take place and vigorous stooling results. In June the soil temperatures are falling rapidly towards the minimum required for germination and active plant growth, consequently some of the seed fails to germinate, and what does germinate, does not stool readily.

The character and tilth of the seed bed is obviously important. A rough open tilth will need a much heavier seeding than a fine, firm consolidated tilth. Air spaces and hollows in the seed bed are great enemies to young germinating wheat plants. It is not necessary that the surface tilth for wheat should be like an onion bed. Indeed, such fine tilth may be detrimental in bringing about premature caking and crusting of the surface. But it is essential that the under portion of

the furrow slice should be fine and firm, though the surface may be cloddy. Early sowing on clean land in good tilth requires the minimum seeding, and the better the tilth the less the seed required.

The variety and character of the wheat should be taken into consideration. Some varieties, like Bunyip, Hugenot, and Clubhead, are poor stoolers, and need heavier seeding: whilst Federation, Jade, Genoa, are good stoolers. Small-berried wheats, like Comeback and Bobs, need lighter sowing than large-berried varieties like Hugenot, King's Early, and Gluyas.

Finally, the depth of sowing and the mode of pickling the seed for smut have an important influence on the germination of the seed. The deeper the seed is sown, especially in clay soils, the lower the percentage of germination.

In an interesting series of investigations extending over a period of three years, Professor Perkins, of South Australia, found that in heavy clay loam soils—

(*a*) Seed placed 1 inch deep gives the best percentage of successful germination.

(*b*) Germination continues to be satisfactory to a depth of 2½ inches.

(*c*) The percentage of germination falls off as the depth of sowing increases, and at 4½ inches over 50 per cent. of the seed is lost.

Quantities of Seed to Sow.

Taking all these factors into consideration, we may say that the rate of seeding for the Mallee ranges from 35 to 60 lbs. per acre. In the Wimmera and Goulburn Valley, 50 to 75 lbs. is the normal seeding, whilst in the North-East and Western Districts, from 65 to 90 lbs. is customary. For hay crops, 15 per cent. to 20 per cent. heavier seedings should be used than for grain crops.

The farmer needs to use judgment as to whether the minimum, the mean, or the maximum for his district should be sown, by considering all the points enumerated above. With early sowing, at shallow depths, on well-tilled land, and with good stooling varieties of wheat, the minimum sowings may safely be used. As the seeding advances, and soil temperatures fall towards the minimum for successful germination (41 degrees Fahr.) the higher limits of seeding must be used, and very late seeding requires the maximum quantities.

What seeding may be given to that large area of worked-up land which failed to mature a crop last season, and which therefore is really a two-year fallow? In view of the fine tilth, and the enforced rest, and the absence of weeds, these lands should mostly be in excellent condition and well consolidated, and the minimum seedings above specified may safely be reduced by 5 to 10 lbs. this season. For, if April and May rains are at all copious, the stooling and germination should be unusually good on these enforced fallows.

In view of the high price of wheat, and the scarcity of good local seed, many farmers have been compelled to use seed for wheat purposes which in good seasons they would probably hesitate to sow. Smut was fairly prevalent in the Western District last season, and much of the previous harvest (1913) was affected with smut. This may be seen from the number of bags of smutty seed found and rejected among the 410,000

bushels of seed purchased by the Department of Agriculture for distressed settlers.

Pickling the Seed.

Care should be taken, therefore, to see that clean seed is sown, or if seed slightly smutted has to be sown, particular care should be exercised in pickling the seed. As is well known, both bluestone and formalin interfere with and delay the germination of the seed. The amount of grain actually killed in the process of pickling depends on the strength of the pickling solution, the mode of pickling, and the condition of the soil in which the pickled grain is sown. This subject was discussed fully in "Wheat and Its Cultivation" (Bulletin 22, issued by this Department), and it is unnecessary, therefore, to refer to the matter in detail. But it may be said here that, if the seed is at all smutty, and bunt balls are present, bluestone should be used rather than formalin, as the latter has little power to prevent re-infection of the grain, though it is quite efficacious in killing all spores attached to the grain. Moreover, in such cases, the grain is best pickled by immersing the seed in a 2 per cent. solution of bluestone (2 lbs. bluestone in 10 gallons of water) for three to five minutes, and in such a way as to cause all bunt balls to float to the surface of the pickle, where they can be skimmed off. If these bunt balls, whose hard, impermeable coats protect the myriads of smut spores within from the pickle, are not removed, they are liable to be broken in passing through the force feed attachment of the drill, thus liberating the enclosed spores and bringing about re-infection of the seed.

Pickling by Immersion.

Several cheap patent pickling devices based on the immersion principle are now on the market. A common principle adopted is to use a wooden receptacle, such as a cask for containing the pickling solution, a perforated copper vessel to hold the wheat, and a pulley and tackle to haul the wheat in and out of the solution. The wheat is poured from a bag in a stream into a perforated copper vessel immersed in the bluestone. Any bunt balls immediately get separated from the stream of wheat, and float to the surface of the pickle, whence they are removed by skimming. After immersion for the requisite period, the vessel of wheat is hauled by a pulley out of the pickle, allowed to drain, and then swung round over the mouth of a bag. The false bottom of the vessel is then unfastened, and the wheat drops in a mass into the bag.

If the seed appears quite free from smut, or is known to have been produced from clean paddocks, a much weaker pickling solution may be used. In this case, 1 per cent. solution of bluestone (1 lb. bluestone to 10 gallons of water), or a solution of formalin 1 in 500 (1 lb. of Formalin to 50 gallons of water) would be strong enough. A more satisfactory germination would result, and the young growth would come away quicker than with the stronger pickling solution.

Necessity for Cultivation.

The cultivation of the soil preparatory to seeding needs careful attention. The practical absence of spring, summer, and autumn rains, has prevented ordinary fallow land being brought into that condition of tilth usually found at this time of the year. Rain is an important

factor in tilth production, and its absence for the past nine months will result in hollow, cloddy seed beds, and great care will be necessary in bringing these into a condition suitable for sowing.

On the other hand, most of the worked-up stunted crop lands are in excellent condition—practically equal to a two years' fallow—and seeding operations could therefore begin on these, leaving the ordinary fallow and stubble ploughed land to mellow down with the first rains.

Varieties to Sow.

Many farmers make it a regular practice to sow three or four varieties of wheat. This is commendable, for it avoids the risk of having all the farm eggs in the one basket, though it slightly increases the work at seeding and harvest time.

There is now a very wide selection of varieties available for farmers, and the difficulty often is to know exactly what to sow. Varieties like Federation find a place on nearly every farm, and in some districts Federation practically monopolizes the area. An interesting example of this was noted at Minyip this season. In sorting out and classifying a line of wheat bought by the Department of Agriculture, of 22,816 bags, and stacked on the Minyip station, no fewer than 21,005 bags, or over 92 per cent., was Federation.

In the Mallee districts, especially the new districts, Federation is not so popular, on account of the shortness of its straw, and its susceptibility to fungus diseases. Varieties like Mac's White, Dart's Imperial, Gluyas, Viking, and King's Early, are widely grown. In the Wimmera and Northern Districts, however, Federation holds pride of place, though considerable areas of Yandilla King and Dart's Imperial, are grown. Varieties like Currawa and Penny are likely to be of use in these districts. In the North-East and Western Districts, where the growing period is longer, Marshall's No. 3, Yandilla King, Penny, and American No. 8 are useful varieties to grow.

In sowing these wheats, care should be taken to sow the late-maturing, slow-growing types, like Marshall's No. 3 and Yandilla King, first; and quick-growing, early-maturing types, like King's Early, Bunyip, and Gluyas, last. It is necessary to emphasize this fact, as it may be supposed that the "early varieties" should be sown early, and "late varieties" should be sown late. In practice, however, the exact opposite is the case.

Dry Sowing.

So far as the time of sowing is concerned, the conditions at the present time (15th March) are such as to render early sowing fairly safe—certainly much safer than at the corresponding periods of the three previous years.

Oats and barley may certainly be sown with little risk, for the husk of these seeds acts as a natural protection against malting. Whether the farmer should commence seeding his wheat, or wait for substantial rains, depends on what acreage he has to sow, the team strength available for the purpose, the condition of the fallows, and the quantity of fodder on hand or in sight. Those who are at present feeding their teams on high-priced chaff purchased from the city, will probably decide to go straight on with the seeding, and take the risk of the seed malting. As mentioned above, the risk of malting will be, not in the condition

of the soil, but in the nature of the subsequent rains. The soil is dry enough in most districts to make dry seeding quite safe. The only danger lies in patchy isolated showers, followed by a burst of drying weather.

Those who have good supplies of fodder, adequate team strength, and their cultivation well in hand, will naturally prefer to wait till rain gives them an opportunity of putting the seed in under the most favorable conditions. Seed is safer in the barns than in a dry seed bed.

MANURIAL PROBLEMS.

An interesting problem at the present is the determination of the quantity of manure to be sown this year. It is of especial interest in view of the fact that a large proportion of the area seeded in 1914 failed to reach maturity, and the question arises as to whether the super applied last year is still in the soil, and still in the same form as it was applied. Much difference of opinion exists among farmers as to whether the land that received a dressing of manure last year, but, through drought, failed to produce a crop, should receive a dressing of super again this year; and, if so, whether a partial or a full allowance of fertilizer should be sown. To settle this matter, a few facts concerning the action of superphosphate on the soil are worthy of notice.

What Happens to Superphosphate.

In the first place, it must be remembered that if 60 lbs. of superphosphate were applied with the seed last year, that 60 lbs. will not be present in the soil now in its original form. If a crop failed, through drought, to materialize, the phosphoric acid, which is the active and important constituent in superphosphate, will have almost completely changed into other forms, which are less available than the phosphoric acid in freshly-applied super. When phosphoric acid is applied to a soil in the form of super several important changes take place in its mechanical condition and chemical composition. The phosphoric acid, which is present in a form known as water soluble phosphate (monocalcic phosphate of lime), becomes more or less completely dissolved in the soil moisture and the early rains. It thus assumes the same mechanical condition as sugar or salt when dissolved in water—that is, it becomes divided up into infinitely small particles—particles much finer than you could get by any known process of mechanical grinding. In this infinitely minute form, it gets diffused right throughout the soil by capillary action.

But changes are rapidly going on in the composition of the phosphate. As it moves through the soil in solution it comes into contact with lime, iron, alumina, and other soil bases, and gradually it gets converted into a form of "reverted phosphate," or "citrate soluble phosphate," whilst a smaller portion gets converted a stage further into insoluble phosphate. At what rate does this reversion go on? Experiments were commenced some months ago in the departmental laboratory to find out the rate of reversion of superphosphate when applied to Werribee, Rutherglen, and Longerenong soils, and whilst these investigations are still in progress, the results obtained by Messrs. Scott and Robertson indicate that the rate of reversion in all cases is relatively rapid, and that approximately one-half of the super is reverted within two weeks of application. Why, then, it may be asked, is super so

superior in its action to the less soluble phosphates—basic slag, bonedust, and rock phosphate?

The question, indeed, is very pertinent. Owing to the solubility of the phosphoric acid in super it gets immediately dissolved in the rain and soil water. In this form, its particles are infinitely small. In this infinitely minute form the solution of phosphoric acid coats every soil particle in the neighbourhood of the roots, and then gradually gets converted into the reverted form at the surface of each soil particle. It is this fineness of subdivision of the phosphate, and its infinite diffusion through the soil, that make its action superior to basic slag and other phosphates.

A second fact of importance regarding superphosphates is that the extent of the reversion depends on the time elapsing since its application. Preliminary experiments on Werribee soils have shown that, at the end of two weeks, 54.3 per cent. of the phosphoric acid in superphosphate was reverted to the citrate soluble state, and 32.5 per cent. converted into an insoluble form, whilst 13.2 per cent. was still in its original water soluble condition. At the end of twelve months it might be expected that the whole of the super would be converted into reverted phosphate and insoluble phosphate.

Effect of Super on the Young Crop.

Now, one of the most important influences exerted by super is its effect on the young root system. It acts as a crop starter, giving the crop power to make very vigorous early growth. Phosphoric acid is the soil's most deficient constituent. Unless, therefore, the young crops can secure liberal amounts of available phosphate in the early stages, the early growth is stunted.

It is a matter of common observation that early sown crops do best in the majority of seasons. They get their roots well down into the warmer subsoil before the cold snaps of winter come on. They are thus able to grow and stool vigorously when late crops are germinating with difficulty in the colder surface layers. They appear to grow and develop when the late sown crops are stationary, and the well-developed root system ramifying in the warm under subsoil keeps the overhead portion supplied with the wherewithal to keep going. Super applied with the seed has a similar effect. The young plants find the phosphoric acid quickly; they develop rapidly; and the roots find balanced quantities of water soluble and citrate soluble phosphates as they develop. It is this initial "kick-off" that the super gives to a plant that enables a supered plot to excel any other phosphatic dressing in harvest results. It stimulates root development, and encourages, and, indeed, makes possible, vigorous stooling. The vigour of growth is ever governed by the actual amount of the most deficient plant food present. Let water soluble phosphate be absent at the critical stage of a young plant's career, and its development will be retarded, and its ultimate yield reduced. What, then, is the bearing of these facts on the present problem?

It seems clear that land which received a dressing of super last season will require another application this year. The water soluble phosphate of the super applied last year has been mostly converted into less soluble forms. Certainly very little, if any, will be left in its original water soluble condition. Consequently, dressings of super should be given with the seed this year in order to have the essential soluble phosphate in the critical sphere of root development during the early stages of growth.

Rate of Application.

Should a full dressing be applied? This is unnecessary, for a considerable portion still remains in the soil as citrate soluble phosphate, and sufficient super. should be applied to give the plant the vigorous start essential for success. For these lands, therefore, a dressing of two-thirds to three-quarters of the normal dressing is recommended.

The non-manuring of these lands is to be strongly deprecated.

What should the normal fallow receive? So far as the lands fallowed up last winter and spring are concerned, it must be borne in mind that, in the absence of soil moisture from the fallows due to the prolonged drought, the formation of soluble phosphates from the insoluble reserves of the soil will not have proceeded at a normal rate. The amount so formed this summer will certainly be less than that formed in a normal season, consequently, the shortage must be made good by increased applications of artificial manure if the fullest benefit of the rainfall is to be obtained. If, as might reasonably be expected from previous droughts, the winter rainfall is heavy in 1915, the crop will be able to reap the full advantage of a heavier dressing. In this connexion, the results obtained from moderately heavy dressings of super., as compared with light dressings, even in dry seasons, are worth studying. These are given in detail in "Results of Field Plots" in this issue.

Every advantage should be taken to secure as high a gross and net return per acre as possible. With the prospective high prices for wheat, liberal manuring offers the farmer a sure and effective means of increasing his profits.

Summing up, we may say:—

(1) Worked-up stunted crop lands should certainly receive an allowance of superphosphate—and two-thirds of a normal allowance is recommended.

(2) Ordinary fallows, and autumn-ploughed grass lands, should at least receive a normal application, and there is every advantage, and little risk, in increasing by 20 to 25 per cent. the quantity of super. ordinarily sown.

Seed Wheat Supplies.

During the past four months, the Department of Agriculture has purchased, sorted, and classified 410,000 bushels of seed wheat for distribution among distressed settlers. Of this, 120,000 bushels of named varieties were purchased from farmers from the new season's crop, and this has already been distributed (15th March) among holders of Government orders. The balance of the stocks on hand represents wheat of the 1913 crop purchased on country railway stations, and this has since been classified into varieties, and is now in process of distribution. The stocks on hand are sufficient to supply every outstanding Government order for seed, and leave a fair quantity for those who have not yet been able to secure seed.

The Government, through the Seed Wheat Boards and Mallee Relief Boards, has approved to date of advances to the extent of £413,558 for relief of settlers, of which approximately £220,000 represents advances for seed wheat, and the balance represents advances for fodder and seed oats.

The timely distribution of this relief has enabled the farmers in the drought-stricken districts to carry on their work, and make provision for the seeding of their holdings.

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 137.)

HISTORY.

Various attempts have been made by investigators to discover the original home of the maize plant, but so far as can be ascertained Southern Mexico appears to have been settled as the most probable source. As far back as 700 A.D. it is said to have been grown at Rio Grande, and in 1492, when Columbus discovered America, maize was generally cultivated. It was then introduced to the world, receiving various names in different countries, and rapidly came into favor, until at the present time it is one of the most valuable crops of commerce.

Maize belongs to the Gramineæ, or grass family, in common with other cereals, and is divided into several groups, namely:—

Order—Gramineæ.
Tribe—Maydeæ.
Genus—*Zea.*
Species—Mays.

These, again, are divided into sub-species or types as follows:—

I. Dent maize (*Zea Indentata*).—There are a number of varieties of this type showing considerable variation; it is, however, a large type, requiring a long period in which to mature. The horny endosperm is located at the edges of the kernel, and the soft endosperm in the centre of the outside end of the grain. As the cob ripens this softer material shrinks, causing a depression or dent in the seed which gives rise to the name. The ears have a large number of rows of grain, the latter being long wedge-shaped and closely packed. The cobs are thick in proportion to length.

Dent maize grown under suitable conditions is, as a rule, one of the heaviest yielders.

II. Flint maize (*Zea indurata*).—Has a round hard tip to the grain owing to the soft endosperm being nearer the centre of the grain with the hard endosperm on the outside. There is consequently no indentation, and the shrinkage is uniform.

Both stalks and cobs are smaller than is the case with Dent varieties, the latter being narrow and long in proportion. The number of rows of grain are fewer and the seed somewhat loosely set. This type is quicker in maturing than the Dent, and is consequently better suited with a shorter season.

III. Soft maize (*Zea amylacea*) is a broad, round type, the interior of the grain being composed of a soft starchy endosperm with little horn. The ear is somewhat short and thick, the shape of the grain being round and large, with little or no indentation. This maize requires a long season in which to mature, and is useful for silage purposes or green fodder.

IV. Sweet maize (*Zea saccharata*).—Has a translucent horny appearance of the endosperm, and wrinkled kernel when matured, the starch is largely reduced to sugar, the ears are small, and the grain broad and rounded.

Different varieties require different lengths of time to mature. It is useful for table use and silage.

V. Pop corn (*Zea everata*).—Has a very horny endosperm, which, when subjected to heat, turns inside out, exposing an enlarged white mass. There are two families, known as rice and pearl. The cobs are small and plentiful. This maize is only grown for human consumption.

Brewer's Yellow Dent Variety Maize, grown on Mr. J. Gilbert's Farm, Orbost.

There are several other types which are not of practical value, and need not be dealt with here. Of those mentioned the Dent and Flint types are most in favour for grain, the sweet maize and popcorn being grown to a very limited extent.

Varieties.

There are at least 1,000 varieties of maize, which can be accounted for by the fact that the plant is easily cross-fertilized, and also that its characteristics are soon altered by the influences of soil and climate to which maize will, up to a certain point, adapt itself.

The red, or yellow varieties have been the most popular in Victoria, though the white varieties have proved prolific. Apparently buyers prefer coloured maize, and growers cater for them in this respect, notwithstanding the fact that the feeding value in both is practically the same. The intending grower should be careful to suit his variety to the soil and climate in which he operates. There is a considerable risk in growing a slow maturing maize where early frosts are liable to occur, and even if no frosts appear cool weather, about the filling stage of the cob, will have a bad effect on the yield. At the same time, to grow early maturing varieties where the season is long, is to limit production, for the reason that the slower maturing varieties are invariably the heavier yielders. It is found also that some maize is better suited to heavy soils than others.

Where the season is long, but the latter half is generally dry, early varieties, or medium early varieties, are likely to prove most profitable, consequently the grower should exercise careful judgment in selecting maize for his own special conditions. The following description of a few of the best-known varieties may be of assistance to beginners:—

Funk's Yellow (Dent).—This variety is grown at Orbost, Cann River, and Bruthen, and is popular in most of the coastal districts. It has a pale-yellow colour, the cobs measuring 9 to 12 inches in length and 7 to 8 inches in circumference. The ears are slightly tapering, and the indentation slightly rough. The grain is deep and the tips well filled, the butts being well rounded. It is a fairly late maturing variety, and yields well.

Sibley, a rather early maturing yellow maize, fair yielder, looked upon as very safe and a favourite in Gippsland.

Longfellow (Flint).—In shape is slightly tapering, 10 to 12 inches in length and 5 inches in circumference; the grain is firm on the cob, medium yellow in colour, with no indentation; the shape of the seed is broad and wedged; the space between the rows is wide, and the number of rows ten to twelve. The butts fill well, and the tips fairly well; the colour of the cob is white; the percentage of grain to cob being small, medium early.

Reid's Yellow (Dent).—Is likely to become a favourite, is medium late, ears 9 to 11 inches long and 7 inches in circumference, with eighteen to twenty rows of grain, colour medium dark-yellow with a tinge of red, compact on the cob; the kernels are narrow and thick; the butts and tips well covered; the shank small, suits rich soil or medium soils, and should do well inland.

Leeming (Dent).—Medium early; adaptable to climate; ears tapering and closely filled, short, gives a high percentage of grain to cob; colour light-red, cobs well covered with husk. One of the best varieties grown inland for fodder purposes, keeping green well into the autumn, with a medium heavy stalk and good leaf.

Eclipse, same as Leeming; can be planted very late for silage.

Hickory King.—White maize; a fair grain yielder, small ear with few rows of large broad smooth grain; late in maturing. A favourite fodder maize, growing plenty of foliage with soft stem.

Boone's County White. Medium early variety; very large ear, cream colour, fills well; indentation rather rough; short husks; grain long; useful for grain or fodder.

Sibley Variety Maize, grown on Mr. E. Waller's Farm, Orbost. Estimated to Yield 100 Bushels to the Acre.

Yellow Moruya.—A fine fodder maize, large yielder, grain large flat, rounded, yellow; late maturing.

Ninety Day.—Early maturing; short stalk; light yielder; very little

Silvermine.—Colour, dull white; shape cylindrical, with tapering tip, large circumference in proportion to length; big space between rows; grain broad; indentation rough; percentage of grain large; medium early in maturing; good husk; suitable for medium soils.

Brewer's Yellow Dent.—A good all-round variety, fairly early ripener, and good yielder. Its chief characteristic being the ripening of the ear while the stalk is still green. It can be harvested for grain, and the stalk afterwards turned into silage and fed as green fodder; said to be the heaviest yielding early variety known; has abundant green leaves, the ears containing twenty-two rows, with fifty kernels in each row.

James's Yellow Dent (introduced by Mr. H. James, of Orbost).—A good early, heavy-yielding maize, said to be an improvement on Funk's Yellow Dent.

Corn planter.—Very similar to Boone's County White; heavy yielder.

Minnesota No. 13 (lately introduced by Mr. James).—Rather small ear, very well filled, with a beautifully shaped kernel of bright colour, good yielder, acclimatised two years, and likely to become popular.

There is a good prospect before growers to specialize in pure seed maize production, as there is a constant demand for the pure article at high prices. Maize is, however, easily cross-fertilized, and it is only in isolated or specially-protected places that such operations can be successfully adopted. There are, however, many such places situated in creek valleys and the upper reaches of our rivers admirably adapted for such work. No other maize should be grown within at least a mile of such plots, as the pollen may easily be carried or blown that distance, and the seed become infected.

One variety only should be used, and that one chosen from those most suited to the environment and requirements of similar districts. A system of seed selection should also be adopted at the same time, in order to still further improve the general qualities of the crop, and add to the yield.

Work of this description is being done by a very few farmers in Victoria, and the importance of such methods can hardly be exaggerated. The effect on the whole yield for the State could be increased, and incidentally the profits to each individual grower.

Climatic Influence.

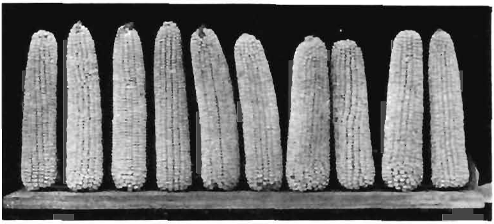
Maize takes from three to six months to mature, according to the varieties used and the conditions under which it is grown. A heavy frost after germination or before the ripening stage is reached, is liable to destroy the crop; therefore, to be reasonably safe, maize must be grown where in normal seasons frosts are absent during the growing period. Other elemental factors are sunshine, humidity, rainfall, and wind. Sunshine provides the required energy for the activity of plant growth, and with maize particularly has the effect of preventing disease, and supplying the warmth required to ripen the crop. Humidity of atmosphere is not actually indispensable for maize where a sufficient amount of artificial water can be supplied, but growing under natural conditions is always desirable.

Rainfall to a sufficient extent during the summer months is essential where irrigation is not practised, with judicious cultivation less rain can be made efficient than would otherwise be the case. The regularity or uncertainty of the rainfall also influences the crop materially.

Best Six Green Stalks and Cobs, Orbost Show, 1915. 13 Feet High.

Montgomery estimates that the transpiration of 14 to 20 tons of water is necessary for the production of a bushel of maize; therefore, for a 50-bushel crop, 7 to 10 acre inches would be required, and in *proportion for larger crops, allowing for loss due to drainage and*

evaporation not less than 12 inches should be necessary. There will be also some variation in regard to the soil, some having a greater moisture-holding capacity than others. A fairly-evenly distributed rainfall is naturally best, but perhaps the most valuable fall is that which occurs just after the grain has started to form. That also is the time when maize grown under irrigation should receive its last good watering.



First Prize Maize Cobs, Orbost Show, 1915.

Wind.—Hot, drying winds are highly detrimental to maize, checking the growth, and in some cases blowing the maize down. Situations where the natural rainfall can be supplemented by irrigation are especially good, and there are many such in Victoria where maize could be made a profitable crop.

Second Prize Maize Cobs, Orbost Show, 1915.

The length of season greatly affects the yield of the crop, the slower maturing varieties being the heaviest yielders, excepting where the absence of rain or irrigation is felt in the later stages of growth.

For fodder maize, which does not involve the maturing of grain, colder and shorter seasons will suffice, the main requisites being a suitable soil and sufficiency of rain or water.

Soil.

Maize likes a warm, deep, friable soil, in which good drainage is essential, with a fair capacity for holding moisture. Alluvial flats of good quality are possibly the best, though rich upland soils also produce good crops.

Poor land deficient in humus is not suitable, and will not grow maize for grain, though if well-treated may be utilized to produce fodder crops. Heavy stiff soils and sour soils are undesirable, a plentiful supply of nitrogen being necessary, and such soils do not lend themselves sufficiently to nitrification. The flats along the Snowy River and Tambo are probably as good as any in the world for maize production, crop after crop for over thirty years has been taken off, and yet the yields do not diminish. This is due largely to their being silted up every year by floods which bring down *débris* from the hills, leaving deposits inches deep of rich material, which constantly renews the land. Manures are not used, neither is any rotation system in vogue. Other districts are not so fortunate, and proper systems of manuring and rotation cropping would greatly increase the profits.

Maize has deep-rooting habits, consequently a free, friable soil is good; the roots require air and warmth, which such soils provide, in addition to good drainage. Free, sandy loams of good depth, rich, friable clay loams, and good chocolate volcanic soils, are all suitable where situated in warm districts, with sufficient rainfall.

Preparation of the Soil.—Much of the success attendant on the growth of maize is due to a thorough preparation of the land. Virgin soils often produce good maize crops for the first couple of years, and afterwards refuse to give profitable returns. This is often caused by bad cultivation, want of rotation systems, and manures.

Maize is a large nitrogen feeder, and this element of plant-food can be considerably augmented by fallowing. Wherever possible, land should be ploughed as deeply as the surface soil will permit in the early autumn, 8 inches to 9 inches in ordinary soils, and where heavy clay soils are worked, if the surface soil is not sufficiently deep to allow of this practice, a lesser depth of ploughing followed by subsoiling is advisable. The effect of an early fallow is to increase nitrification enormously, as is shown by the tests conducted on Longerenong Government Farm, which are quoted below—with comments by Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, as follow:—

"From the table it will be seen that the amount of nitrate in the fallowed land gradually rose from 59½ lbs. in December, to 118.3 lbs. in the first week in February, after which it gradually fell to 91.87 lbs. per acre, as contrasted with 21 lbs. in the non-fallowed portion. As a 15-bushel wheat crop removes in its grain and straw about 21 lbs. of nitrogen per acre, it will be observed that there was four and a half times more available nitrogen in the fallowed portion at seed time than was required for a 15-bushel crop.

On the other hand, in the non-fallowed portion there was barely enough nitrogen to supply the requirements of one such crop even assuming that every particle of nitrate nitrogen in the first 5 feet could have been used by the crop.

Moreover, at seed time, the nitrate nitrogen in the fallowed land amounted to 71 *lbs.* per acre above that of the non-fallowed portion.

If nitrate of soda containing 15 per cent. of nitrogen be worth 14s. per cwt., then the cash value of this extra nitrate content of the fallowed land over that of the unfallowed portion amounted to no less than £2 19s. 2d. per acre."

TOTAL NITRATE NITROGEN IN THE FIRST FIVE FEET OF FALLOWED AND NON-FALLOWED LAND UNDER ORDINARY FIELD CONDITIONS AT LONGERENONG (VICTORIA), 1912.

Date of Sampling.	Amount of Nitrate Nitrogen. (In Parts per Million.)		Amount of Nitrogen. (Reduced to lbs. per Acre.)	
	Fallowed.	Non-fallowed.	Fallowed.	Non-fallowed.
			lbs. per acre.	lbs. per acre.
(1) 7th December, 1911 ..	3·4	Not taken	59·5	Not taken
(2) 4th January, 1912 ..	4·6	2·18	80·5	38·15
(3) 6th February, 1912 ..	6·76	1·10	118·3	19·25
(4) 28th March, 1912 ..	6·00	1·94	105·0	33·9
(5) 20th May, 1912 ..	5·25	1·20	91·87	21·0
(6) 7th August, 1912 ..	5·12*	1·28	89·6	22·4

* Now under crop.

From this stand-point alone, fallowing is more than justified, but when we realize that, in addition, we get a sweeter condition of soil, further quantities of phosphoric acid, and potash rendered available, and a better seed bed, also the admission of larger proportions of the rainfall, and later on greater supplies of moisture, a fallow becomes almost imperative, and is practically a first rate commercial proposition. Even a couple of months' fallow is better than none, but the earlier the fallow the greater the return.

As the seeding season approaches, the land should be well worked with a cultivator and harrows to get a fine tilth, as such a condition is very important for maize. The first working should be deep and successive workings shallower, in this way a firm consolidated seed bed is formed, and the lumps are brought to the surface. Every working assists in making more of the plant foods available, and in keeping the weeds and insect pests down. As the season advances, the surface should be kept loose with the harrows to prevent evaporation. On loose friable soils no second ploughing will be necessary if the above directions are followed; but on stiffer soils liable to run together it is sometimes necessary to plough again shortly before seeding. Where this is the case, shallow ploughing in the spring, say 4 inches, is best, after which the land can be worked down fairly fine again. Maize and all other crops like a fine firm solid seed bed. The roots are very fine, and get a larger surface-feeding area under such conditions and a healthier state of affairs exists. Open spaces under the surface tend to produce root rot and other troubles, and also prevent the circulation of moisture, through which means all the foods are taken by the crop in a state of solution.

Where the land breaks up lumpy roll first and cultivate afterwards. The roller embeds and cracks the lumps, which then break up more readily with cultivators. If a soil is naturally too friable and open, then heavy rolling to consolidate it is desirable, but the surface should be loosened afterwards with the harrow to prevent loss of moisture.

It is not wise to work a soil down to a dusty fine state, especially a clay loam, as it is liable to set with rain and form a crust, preventing the admission of air and rain, causing evaporation and consequent coldness and loss of moisture, and reducing at the same time the beneficial effects due to oxidation and nitrification.

(To be continued.)

THE WALNUT.

(Continued from page 153.)

C. F. Cole, Orchard Supervisor.

INTERPOLLINATION.

Successful nut production depends upon the simultaneous presence of the two kinds of flowers, staminate (male) and pistillate (female), either upon the same tree, or others growing in close proximity, or at a distance where the transferring or supplying of pollen to the pistillate (female) flower by aid of insects or other external agents can be accomplished. Very little of a specific nature can be written upon this subject as to the distance the pollen of the walnut from staminate flowers upon the one tree may influence the pistillate bloom upon another. For practical purposes, where interpollination is required, planting the trees in close proximity to one another should be carried out.

It is no uncommon thing to see walnut trees producing each year catkins (staminate bloom) in abundance and practically no pistillate (female) blooms, also trees producing pistillate and no staminate blooms. Many walnut trees during the early stages of growth have a tendency to produce female blooms alone, but, as they grow older, eventually produce catkins (male blooms) in sufficient quantity. Enough has been written upon the necessity of selecting a variety, or varieties, for planting out. To be of any commercial value, the tree should yield both staminate and pistillate blooms, particularly the latter, in quantity. The planting of a grove with different varieties that bloom partially or completely at or about the same time is a wise precaution. The interchange of pollen from one variety to another is probably beneficial, if not at times essential, particularly if the staminate blooms should happen to be sterile upon any one variety during any particular season, a thing that may probably occur.

FERTILIZATION.

In Victoria, outside of the application of farmyard manure and a limited quantity of chemical manure, such as bonedust and superphosphate, applied to the young trees at the time of planting, the writer is not aware of any manurial experiments which have been carried out upon scientific and practical lines. The experiments carried out in California upon sound lines do not justify any special recommendations. The trees receiving heavy dressings of stable manure and nitrogenous materials seem to have benefited most. With regard to the trees responding to chemical manures and increasing the yield of nuts, no direct results were obtained. There is little doubt that the practice of using certain manures, combined with thorough cultivation, will ultimately be of the greatest value, especially to old trees and those approaching the age of maturity. Manures containing nitrogen and phosphoric acid—the most-needed elements in almost any plant—produce and maintain improved growth and vigor.

An extract from *Le Noyer et sa Culture*, by F. Peneveyre, of Lousanne, Switzerland.—The author quotes M. Rouault, Departmental Professor of Agriculture for the Department Isère, France, who bases his calculations on the amount of plant-food removed. He continues, "One can thus decide the dose of each manure element to employ for the production of 100 kilos (220 lbs.) of walnuts. The following formula, established on this basis, may be applied to each tree:—

5.3 kilos (11.6 lbs.) nitrate of soda.
0.95 kilos (2.1 lbs.) superphosphate.
0.42 kilos (.924 lbs.) muriated potash.

For practical purposes the following quantities when applying the manure will be as follows:—

11 lbs. 10 ozs. nitrate of soda.
2 lbs. 2 ozs. superphosphate.
15 ozs. muriated potash.

This formula to be varied according to the age of the tree, the abundance of the yield, and also the fertility of the land.

Mixed manuring, with farmyard and chemical manures, which supplies humus rich in nitrogen, and slowly assimilates, certainly produces good results, and permits the reduction of the above quantities, especially of nitrate of soda.

The manure should be spread on the soil in November (May in Australia), or, at any rate, in winter. It should be ploughed in, the depth of such ploughing depending on the nature of the land and the size of the trees." As already stated, the physical conditions of the soil, and the supply of moisture, are of more importance than the chemical composition. Good cultivation is of far more importance for the first few years from planting than using fertilizers and not cultivating. The sowing of field peas is of value. The peas should be sown as soon as the crop is gathered, and ploughed under when in bloom. If necessary in the drier districts, and irrigation is available, the soil should receive a watering, and be well worked up before sowing the peas.

HARVESTING.

The first indications given that the nuts have reached maturity and the time to harvest is at hand is by the husk or outer covering beginning to burst. When the husk opens sufficiently, the nut usually falls to the ground (plate 28). The freedom in which the husks cast the nuts is controlled largely by the conditions of the husks at the time of maturity. In dry localities or dry seasons, particularly if the trees have suffered from the want of soil moisture, the nuts do not leave the husks so readily. Sunburn or injury to the husk during the development of the nut will prevent shedding, the husk adhering to the stone. Cool atmospheric conditions or a fall of rain during the bursting period will greatly accelerate the casting of the nuts. The regularity of nut-casting varies somewhat with different varieties and individual

Plate 28.—Matured Walnuts, about to be cast. Bursting of the husks.

trees. Some trees cast the majority of their nuts within a short while from maturity, others taking a longer period. The usual practice, and one to be recommended, is to shake the trees. To accomplish this, several methods are to be seen in vogue. Permanently attaching fencing wire to the branches, allowing sufficient length to hang down so that the wire can be reached and pulled by standing upon the ground, the wire being loosely fastened around the branch to prevent cutting it through expansion of growth; the using of long poles with stout hooks fastened to the ends, so that the boughs can be shaken without causing injury to the trees; climbing the trees and shaking the boughs with the hands; the ancient custom of thrashing the tree with long poles.

(To be continued.)

NOTE ON THE COST OF HARVESTING LUCERNE HAY.

The fourth cutting of lucerne hay at the Central Research Farm, Werribee, for the present season was made on 8th, 9th, and 10th February. The time occupied by men and horses in mowing, raking, pitching, carting, and stacking the hay for this cut was carefully recorded, and consequently the cost of each operation can be calculated from the data thus obtained. In reckoning the cost of the operations some arbitrary figure for the cost of a horse had to be allowed. This may be taken at 2s. 6d. per horse per day, which covers cost of feeding, attention, and maintenance in normal seasons. This figure is, of course, much less than a contractor would expect to receive for contract work, but it is as much as a farmer would debit his crops with in estimating the actual cost of team work done on the farm.

The area of the lucerne field is 50 acres, but of this 9.83 acres were cut for daily green feed for the dairy herd, and is not included in the area under review. The balance—40.17 acres—was cut for hay and yielded 45.27 tons of commercial lucerne hay, containing 85 per cent. of dry matter, or an average cut of 22½ cwt. per acre over the whole area.

The wages of farm labour is reckoned at 7s. per day—the actual cost. The following table, showing the segregation of wages and horses on the various items was supplied by Mr. H. MacDermid, Officer in Charge of Records, Werribee:—

TABLE I.

SUMMARY OF COST OF HARVESTING 40.17 ACRES LUCERNE AS LUCERNE HAY.

Hours Worked.	Cost of Horses.	Cost of Mowing.	Cost of Raking.	Cost of Pitching.	Cost of Stacking.	Cost of Carting.	Cost.
	£ *s. d.*	£ *s. d.*	£ *s. d.*	£ *s. d.*	£ *s. d.*	£ *s. d.*	£ *s. d.*
287½ ..	4 8 10	2 5 4	2 6 10	2 12 4	1 4 8	2 6 5	15 4 5

	£ s. d.
Total cost for harvesting 40.17 acres	15 4 5
Cost per acre	0 7 7
Cost per ton	0 6 3½

The following table shows the analysis of the expenditure:—

TABLE II.

ANALYSIS OF EXPENDITURE INCURRED IN HARVESTING 40.17 ACRES LUCERNE.

—	Hours.	Total Cost.		Cost Per Acre.	Cost Per Ton.
		£ s. d.	£ s. d.		
Mowing—					
Cost of labour .. .	65½	2 5 4			
Cost of horses, at 2s. 6d. ..	..	1 15 3		s. d.	s. d.
			4 0 7	2 0	1 8*
Raking—					
Cost of labour	53	2 6 10			
Cost of horses . ..	..	1 1 1			
			3 7 11	1 8	1 5*
Pitching—					
Cost of labour .	72½		2 12 4	1 4	1 1
Stacking—					
Cost of labour	33½		1 4 8	0 7½	0 6
Carting—					
Cost of labour . ..	6	2 6 5			
Cost of horses	..	1 12 6			
			3 18 11	1 11½	1 7½
	287½		15 4 5	7 7	6 3½

* Calculated on dry weight, not on weight of green crop.

With an average cut of lucerne equal to 1 ton per acre, the cost per ton and the cost per acre would, of course, be identical. From the above table, it will be seen that the cost of the various operations per acre was as follows:—

	s. d.
Mowing	2 0
Raking	1 8
Pitching	1 4
Stacking	0 7½
Carting	1 11½
Total cost	7 7 per acre.

The figures per ton for mowing and raking are of course calculated on the basis of dry hay. The real cost per ton of cutting and raking the green lucerne would be only about one-third of the above cost, since the lucerne at the time of cutting contains thrice the tonnage of the cured lucerne hay.—A.E.V.R.

GREEN MANURING EXPERIMENTS.

Field trials and laboratory experiments were made with a green manure obtained from crops of "*Crotalaria juncea*" (Sann hemp) in Pusa soil. The general result of the field trials was that no advantage accrued to the succeeding crop from the previous green manuring.

In the laboratory experiments the optimum moisture content of the soil for nitrification was 18 per cent., *i.e.*, with the soil three-eighths saturated; under this condition 67.8 per cent. of the nitrogen of the manure was nitrified in eight weeks. The optimum depth for burial varied with the age of the plant, and also with the aeration and moisture of the soil, the more mature plant requiring to be buried nearer the surface. The biological activity of the soil was tested by the amount of carbon dioxide formed per day; the addition of the green manure increased the carbon dioxide about ten times, and the addition of a fertilizer such as superphosphate or bone meal to the green manure still further increased the evolution.

Indications were obtained that the first stages of decay of the green manure were brought about mainly by fungi.—C. M. Hutchinson and S. Milligan, Agricultural Research Institute, Pusa, India. *Bulletin No.* 40, 1914.

The distance travelled to plough 1 acre can be reckoned from the width of the furrow. At 6 inches wide it would be necessary to travel 16½ miles.

In 1911 there was 1 acre under crop for every 14 acres in Victoria. In Tasmania the proportion was 1 acre to 58; in New South Wales 1 to 59; in South Australia 1 to 89; in Queensland 1 to 643; and in Western Australia 1 to 730.

FOURTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY, 1914-1915.

Monthly Report, Ending 14th March, 1915.

The past month was again noteworthy for the wide range of temperatures between the hours of 6 a.m. and 6 p.m. The highest for the month was 109 deg. in the fowl-houses, at 2.30 p.m. on 15th February; the lowest was 46 deg., at 6.30 a.m. on 24th February.

The birds have done well generally, and their health was good. The past month was noted for the birds being free from sickness of any kind. The moult is now very heavy, and, of course, egg yield suffers in consequence.

The rainfall for the month was 45 points.

A. HART,
Chief Poultry Expert.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914–1915.

Commencing 15th April, 1914; concluding 14th April, 1915.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Feb.	15th Feb. to 14th Mar.	Total to date—11 months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
36	White Leghorns	E. A. Lawson	1,434	107	1,541	1
25	"	J. H. Gill	1,437	96	1,533	2
26	"	Mrs. H. Stevenson	1,376	129	1,505	3
10	"	R. Hay	1,318	112	1,430	4
9	"	J. J. West	1,303	115	1,418	5
16	"	A. R. Simon	1,315	100	1,415	6
17	"	F. Doldissen	1,282	112	1,394	7
11	"	C. J. Jackson	1,273	116	1,389	8
19	"	Marville Poultry Farm	1,272	115	1,387	9
33	"	W. G. Osburne	1,263	109	1,372	} 10
40	"	J. Schwabb	1,249	123	1,372	
37	"	S. Brown	1,242	104	1,346	12
45	"	H. C. Brock	1,247	95	1,342	13
4	"	Giddy and Son	1,264	76	1,340	14
29	"	V. Little	1,224	105	1,329	15
23	"	S. Buscumb	1,213	114	1,327	16
8	"	F. W. Brine	1,172	124	1,296	17
20	"	A. W. Hall	1,160	127	1,287	18
15	"	E. Waldon	1,176	107	1,283	19
35	"	W. Tatterson	1,194	88	1,282	} 20
1	"	F. G. O'Bree	1,182	100	1,282	
22	"	B. Mitchell	1,156	123	1,279	} 22
30	"	W. G. Robbins	1,164	115	1,279	
47	"	W. G. Swift	1,167	107	1,274	24
14	"	F. C. Western	1,122	121	1,243	25
44	"	A. Ross	1,157	63	1,220	26
6	"	C. R. Jones	1,105	111	1,216	27
48	"	Bennett and Chapman	1,121	86	1,207	28
12	"	A. H. Mould	1,099	98	1,197	29
2	"	J. C. Armstrong	1,114	80	1,194	30
38	"	G. Hayman	1,104	87	1,191	31
3	"	T. A. Pettigrove	1,083	107	1,190	32
24	"	C. Pyke	1,113	75	1,188	33
28	"	Utility Poultry Farm	1,120	64	1,184	34
34	"	W. A. Rennie	1,105	71	1,176	35
32	"	Gleadell Bros.	1,079	98	1,177	36
18	"	All-lay Poultry Yards	1,075	97	1,172	37
41	"	Doncaster Poultry Farm	1,071	95	1,166	38
5	"	A. Mowatt	1,053	111	1,164	39
13	"	H. Hanbury	1,065	93	1,158	40
42	"	E. W. Hippe	1,074	62	1,136	41
43	"	G. Mayberry	1,018	117	1,135	42
31	"	E. H. Bridge	1,047	63	1,110	43
39	"	R. L. Appleford	1,005	101	1,106	44
21	"	R. A. Lewis	988	105	1,093	45
49	"	A. Beer	953	97	1,050	46
50	"	F. G. Silberelsen	946	95	1,041	47
7	"	B. Cohen	910	105	1,015	48
46	"	C. L. Sharman	898	97	995	49
27	"	Walter M. Bayles	890	93	983	50
		Total	57,398	5,011	62,409	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th Feb.	15th Feb. to 14th Mar.	Total to date—11 months.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	1,460	133	1,593	1
55	,, ..	E. A. Lawson	1,382	70	1,452	2
51	,, ..	Moritz Bros.	1,235	104	1,339	3
61	,, ..	H. Hanbury	1,199	107	1,306	4
53	,, ..	C. Lawson	1,208	93	1,301	5
65	,, ..	W. G. Osburne	1,203	60	1,263	6
58	,, ..	Miss L. Stewart	1,162	56	1,218	7
59	,, ..	F. G. Silbereisen ..	1,102	99	1,201	8
62	,, ..	A. Greenhalgh	1,089	94	1,183	9
68	,, ..	E. W. Hippe	1,099	82	1,181	10
63	,, ..	Hanslow Bros.	1,091	90	1,181	10
69	,, ..	C. J. Beatty	1,036	107	1,143	12
70	,, ..	W. H. Robbins ..	1,045	95	1,140	13
52	,, ..	Myola Poultry Farm ..	1,055	69	1,124	14
64	,, ..	E. A. Carne	1,035	85	1,120	15
57	,, ..	J. Jackson	1,008	102	1,110	16
54	,, ..	G. Carter	1,024	74	1,098	17
67	,, ..	Walter M. Bayles ..	1,013	77	1,090	18
66	,, ..	S. Brown	741	66	807	19
		Total	21,187	1,653	22,850	
		HEAVY BREEDS.				
		Wet Mash.				
77	Black Orpingtons ..	J. McAllan	1,331	120	1,451	1
71	,, ..	J. Ogden	1,220	102	1,322	2
88	,, ..	H. H. Pump	1,198	93	1,291	3
89	,, ..	Maryville Poultry Farm ..	1,187	91	1,278	4
87	,, ..	A. Douglas	1,095	108	1,203	5
84	Rhode Island Reds	J. Mulgrove	1,116	79	1,195	6
81	Black Orpingtons ..	D. Fisher	1,094	97	1,191	7
76	,, ..	W. P. Eckermann ..	1,084	80	1,164	8
82	,, ..	J. H. Wright	1,075	68	1,143	9
75	,, ..	Fairdeal Poultry Farm ..	1,043	81	1,124	10
73	,, ..	J. A. McKinnon ..	1,019	95	1,114	11
72	,, ..	T. W. Coto	1,003	108	1,111	12
74	,, ..	S. Brown	1,001	85	1,086	13
83	,, ..	Cowan Bros.	890	57	947	14
85	Golden Wyandottes	J. C. Mickleburgh ..	765	90	855	15
78	Red Sussex ..	*Jorgen Anderson* ..	746	59	805	16
79	Barred Plyth. Rocks	Bennett and Chapman ..	718	53	771	17
80	Buff Wyandottes ..	W. G. Swift	535	55	590	18
		Total	18,120	1,521	19,641	
		Dry Mash.				
100	Black Orpingtons ..	D. Fisher	*1,053*	*67*	*1,120*	*1*
97	,, ..	J. McAllan	989	112	1,101	2
90	,, ..	J. H. Wright	1,022	65	1,087	3
98	,, ..	A. Greenhalgh	1,003	75	1,078	4
91	,, ..	C. E. Graham	912	88	1,000	5
96	Rhode Island Reds	Myola Poultry Farm ..	894	85	979	6
94	Black Orpingtons ..	T. W. Coto	905	58	963	7
92	,, ..	Fairdeal Poultry Farm ..	865	60	925	8
93	,, ..	Myola Poultry Farm ..	820	60	880	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	724	61	785	10
95	,, ..	C. L. Hewitt	469	54	523	11
		Total	9,656	785	10,441	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Pests and Diseases.—All secondhand and odd cases should be thoroughly overhauled. It is preferable to do this now, instead of leaving it till spring, when the rush of duties will certainly prevent such work being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite (red spider); and this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Vegetable Garden.

Vegetable Garden.—There should now be no untidy or undug plots in the kitchen garden. The vacant beds should be well dug over and prepared for the planting of vegetables for use in spring. In digging a top dressing of manure should be given: this may be dug in. All weeds, too, may be forked into trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

A few early peas, also some broad beans, may now be sown. Cabbage, cauliflower, and other seedlings should be planted out from the seed beds. All garden salads and herbs, such as thyme, mint, horse-radish, sage, &c., as well as rhubarb, should be divided and planted out where necessary.

Onion seeds for any early crop may be planted out towards the end of the month. Brown Spanish is very hard to beat as an all-round onion, while the new variety of Early Brown Spanish may be relied upon to produce an early crop.

Flower Garden.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs, and herbaceous divisions should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish

themselves in their new location before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in the roots and crown, with the advent of the first spring weather. When planted in winter, they have no chance to grow, the roots remain as when planted, and with every chance to rot in the cold wet soil, the foliage becomes yellow and debilitated, and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. And then, of course, the season that has been lost can never be regained.

Gardens should now be well drained or trenched. This is a feature more often overlooked than otherwise. And yet no garden can produce the results it should produce unless one or both of these very necessary operations are carried out. There is a wealth of plant food and food supplies below the usual digging depth, and gardeners should never neglect to dig down deeply, so that the roots of their plants may have an increased area in which to travel for food and moisture. Deep working is an absolute essential in every garden. It means a saving of water and manures for the grower, and it also means increased growth, health, and blossoms for the plants. The ground should always be well dug to the full depth of the soil once a year, and an occasional stirring of the subsoil is also invaluable. A mistake often made is that the clay is brought to the surface, and the top soil buried beneath it. Nature's order should never be reversed, and the relationships of top soil, and then subsoil, should always be recognised. After the autumn digging, the ground may be left in a fairly rough state, as the usual climatic conditions will result in a gradual weathering down of the surface. The autumnal dressing of lime is always beneficial.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great liking for such succulent growths. A good surface dressing of broken leaf or dust tobacco will effectively deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust form, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy, and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinums, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

REMINDERS FOR MAY.

LIVE STOCK.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should

be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—As recommended in Reminders for April.

Sheep.—Attend to lambing ewes early every morning, particularly if merinoes lambing to rams of larger breeds. Comeback and first-cross ewes usually commence lambing about now. When crutching for fly, also clear round the udders of all well-wooled ewes; this enables many lambs to live through stormy nights that would otherwise die. Allow sufficient feed in lambing paddocks; hungry ewes are always bad mothers. Prepare inferior fleeced ewes for sale as fats, also any ill-shaped and old ewes; mutton with be greatly in demand from now on. Prize all good fleeced, shapely young ewes of all breeds; these are sure to be of extreme value for years. Do not leave lamb-marking late. In fine weather, ram lambs, when only a few days old, can be castrated, whenever and wherever they can be caught. No assistant is necessary to hold them.

Poultry.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains. Applications for grafted resistant rootlings for 1915 must be made before end of May.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 5. 10th May, 1915.

THE PIG INDUSTRY.

(Continued from page 341, Vol. XI.)

By R. T. Archer, Senior Dairy Inspector.

V.—THE HOUSING OF PIGS.

The principal features requiring attention in constructing pigsties are: 1st, they must be provided with an impervious floor. Where suitable material is available, concrete will be thoroughly satisfactory if properly put down. Brick of good quality, grouted with cement, also makes a first-class floor. The bricks may be laid flat. A fall of about 1 inch in 6 feet will provide for free drainage, so that one can have a floor easily kept sanitary and dry. Concrete or brick floors are not suitable for pigs to lie on; they should be provided with a movable hurdle of lattice-work. This insures a dry bed, and keeps them from the cold floor. They should never be allowed to lie on damp, fermenting bedding, as this will often cause pneumonia. 2nd. The walls and partitions must be constructed so that there are no crevices or open joints through which draughts can strike the pigs lying near. *Draughty sties are a frequent* cause of pneumonia. 3rd. Warmth, particularly in the cold weather of winter, enables pigs to thrive better, making more economical use of their food. At the same time, plenty of ventilation must be provided. 4th. Light is of the greatest assistance in keeping the place sweet and healthy; and 5th, provision should be made for convenient handling.

It is often found satisfactory to work pigs in small paddocks or runs, providing movable houses for shelter and shade, especially to breeding pigs. By moving them about systematically, they can be made to manure a paddock or orchard thoroughly. In this way pigs have been

of immense value in some of the citrus orchards in Mildura and elsewhere. Fig. 1 illustrates a movable sty in the lemon orchard of Mr. H. Jacob, of Mildura. It consists of four hurdles constructed of 6-in. x 1-in. hardwood battens, 3 ft. 6 in. long, nailed on to 4-in. x 2-in. rails, 10 feet long. On one hurdle, and for 3 ft. 6 in. at the end of two others, the

Fig. 1.—Mr. H. Jacob's Movable Pen.

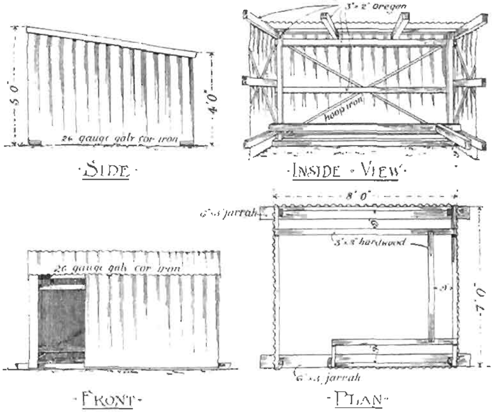
6-ft. x 1-in. battens are close together, which makes good shelter. The remainder are placed 3 inches apart. A couple of sheets of iron laid across the top will provide shelter. Fig. 2 is a movable run made of hurdles in the same way, with a shelter in the corner. In this case they can be fastened together at the ends with wire, and easily removed. Fig. 3 is a movable house, lightly built of wood and iron, and can be

Fig. 2.—Mr. H. Jacob's Movable Run

lifted about or, if put on runners, with boarded floor, can be moved by a horse. This provides for keeping the houses on fresh, clean ground.

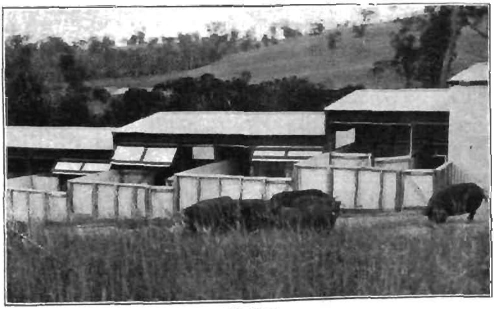
Where possible, the piggeries should be placed on sloping ground. This will facilitate the disposal of the drainage. It may be that sufficient fall will be available to provide that the drainage will flow from the

iggeries into the manure tank and then gravitate from the tank to the anure cart. When this fall is not possible, provision must be made



·PORTABLE · PIG · STY·

Fig. 3.



Pig Cots.

for pumping the liquid manure into the cart. The piggeries must be so situated that the drainage does not run near the cowshed or the dairy.

SPECIFICATION FOR PIGGERY (PAGE 262).

Ground Plan.—The ground to be covered by building to be prepared for cement floor, as follows:—The fall of the floor, from end to end of building, to be 3 inches in 18 feet, the floors of sties to have a fall of 10 inches from partition of passage to outside drain, the passage to be

Tamworth Sows (10 months of age) in Winter Quarters, Central Experimental Farm, Ottawa. Note (1) Uniformity of sows; (2) Good condition and comfort in these quarters.

Swine Cabins, Central Experimental Farm, Ottawa. Winter Quarters for Brood Sows. Note (1) Structure of cabins; (2) exercising yards made of hurdle fences.

level across its width. The ground must be well levelled, and all holes filled in, and then the whole should be rammed. The floor will then be covered with a layer of gravel 1 inch thick, then a layer of concrete 1¾ inches thick will be put down; proportions, one of cement to four of gravel (if screenings of metal can be procured, one in seven will do).

Yards.—The yards on each side of building to be treated in the same manner, and to be finished off to form a shallow drain 12 inches outside of fence of yard; drain to be carried right round buildings, as shown in plan; width of yards, 6 feet.

Cement.—After the concrete is laid it will have a top dressing of cement, ¼ inch in thickness; proportion, one of cement to two of sand. The floor should be covered with wet bags, and kept moist for at least a week. A bed of cement will be formed under all inside partitions, to prevent moisture accumulating in the passage or bedding. All angles of floors should be rounded out so that manure will not accumulate.

Cess Tank.—An underground tank, 6 feet in diameter by 7 feet in depth, will be sunk at one end of building, clear of corner (or where required), to receive the drainage. Inside of tank will have two layers of concrete of same strength as floor, each layer 1 inch thick; then will have a layer of one of cement to one of sand put on ¾ inch thick. The top of tank will be timbered and fitted with pump for removing contents.

Foundation Blocks.—The blocks will be fixed in position before the cementing is done; they will be placed so that they will be flush with the cement floor when finished.

BUILDING.

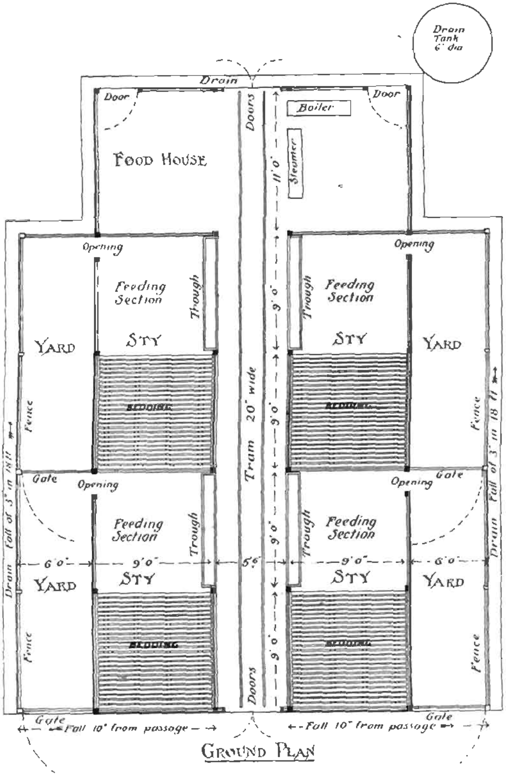
A building sufficient to contain four sties and feed-room will require to be 49 feet long by 23 ft. 6 in. in width. The frame of building will be fixed to framed standards bolted together and placed 9 feet apart.

Standards.—There will be four upright posts in each standard of 4-in. x 4-in. hardwood, mortised into foundation blocks. The outside posts will be 6 ft. 6 in. high from block, the inside posts to be 9 feet in height. The posts will be placed 9 feet apart, and 5 ft. 6 in. between the two inside posts across the centre passage. The rafters will be of 4-in. x 3-in. hardwood, halved across tops of posts and fastened with bolts, a collar tie of same material to be fixed in same manner to connect tops of inside posts. Two rails of 3-in. x 2-in. hardwood to be mortised in posts to carry boards of inside partition; single braces of 4-in. x 3-in. hardwood to be fixed inside posts to rafter.

Partitions.—The partitions between sties to be covered by 6-in. x ½-in. hardwood boards fixed vertically and made draught-proof. Height of partitions, where they touch outside wall, to be 4 feet, and to decrease to 3 ft. 9 in. at partition of passage.

Purlins.—When the principals are fixed they will be placed 9 feet apart, and connected by purlins of 4-in. x 2-in. hardwood, fixed to rafters with purlin blocks, and each joint will be made on alternate principles, so as to strengthen frame. There will be three rows of purlins on each side of roof, and one row on inside of long posts to carry the curved iron that covers the centre of roof.

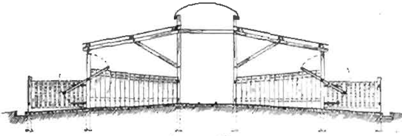
Walls.—The outside walls will be covered by swinging frames of 3-in. x 2-in. hardwood, covered with galvanized corrugated iron. They will be horizontally on a pivot fixed a little higher than the centre, so as to cause the flap to close whenever it is pushed open or the catch released. A catch made of a piece of batten will be fixed in such a manner as to keep the flap open when required. An opening 4 inches wide above all flaps.



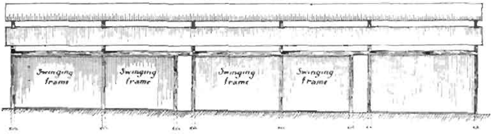
PLAN OF PIGGERY

Scale of Feet.

Openings.—An opening 1 ft. 6 in. wide will be left at end of each sty in the feeding compartment, to allow the pigs access to yards.

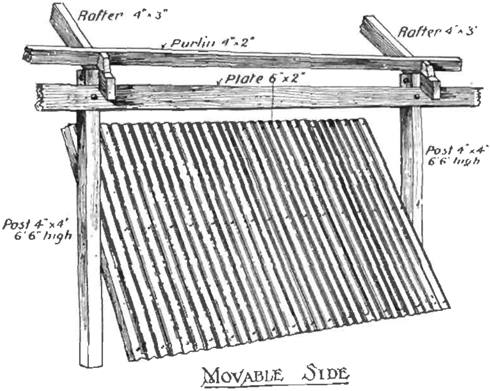


INSIDE VIEW



SIDE VIEW

Sties.—Each sty will be 18 feet in length, and the higher portion will be raised above floor by means of 3-in. x 2-in. hardwood placed on edge,



MOVABLE SIDE

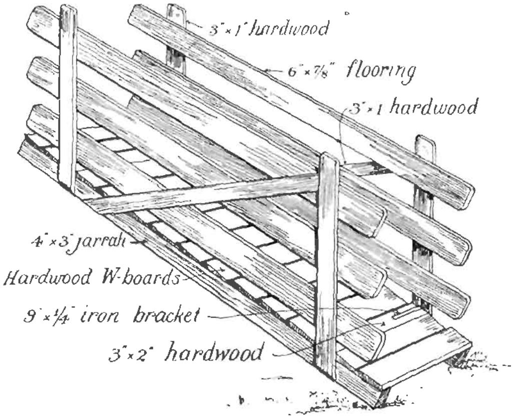
Inside and Side View; also Movable Side of Piggery.

and battens will be nailed to them to form floor for bedding. The battens forming this floor will be fixed a little apart, about $\frac{1}{4}$ inch, to-

allow any water to drain away from bedding. Each sty will be fitted with feeding trough as directed.

Passage.—A passage 5 ft. 6 in. wide will be left down centre of building between sties, and a wooden tramway will be laid to run a wheeled trough along to carry the feed from place to place; the tram rails will be laid 20 inches centre to centre.

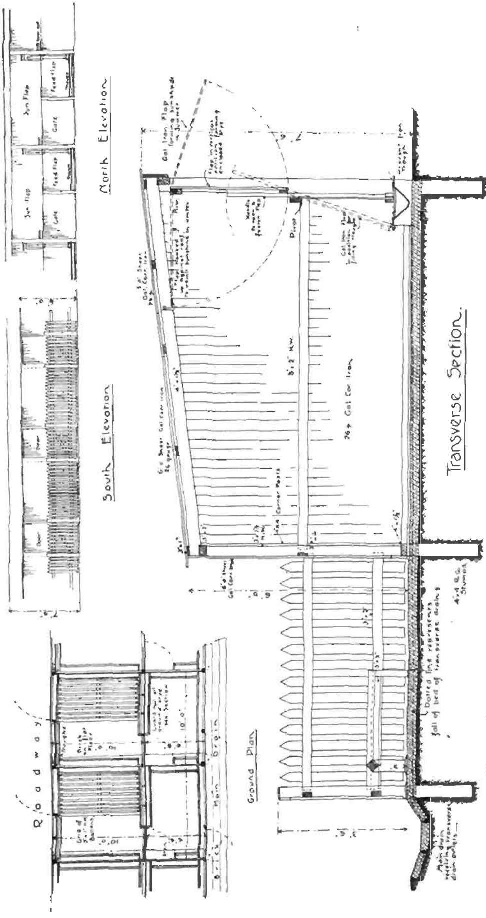
Feed House.—The lower end of building will be used as a steaming house and storeroom for feed. It will be fitted with a boiler of suitable size, and a steaming trough for cooking feed. There will be a door 4 ft. 6 in. wide at each end of building in the centre, and there will be a door on each side of feed house in end wall, about 3 feet wide.



PORTABLE PIG RAMP

Roof.—The two side roofs will be covered with galvanized corrugated iron, 10 feet sheets, fastened with patent spring-head nails to purlins. The centre portion of roof over passage will be covered with curved iron, giving a curve of a foot in a 7-feet sheet. This will provide for ventilation. The whole roof should be covered on outside with Arabic paint, as this tends to keep the building cool in summer. This object may also be attained by making the roof double or lining it underneath with pine or ruberoid.

The chief object aimed at in planning this building is to provide a sty of an up-to-date sanitary character. This is secured by the impervious floor, drains, pit, and the establishment of a proper system of ventilation, and the admission of sunlight to all parts of the interior of



Plan of Pigsty erected at Sparrovale Farm, Geelong, by Geelong Harbor Trust Commissioners.

Breeding Pens.

the building. Ventilation is obtained in this building by leaving openings 4 inches wide at top of walls, and also in the lantern roof, which, of course, has two openings running the full length of building 1 foot wide. If the building is built with its ends in a northerly and southerly direction, the sunlight can be admitted into every part by opening the flaps of the side walls.

In places where bush timber is plentiful, all the framing for this building may be worked out of saplings.

THE GEELONG HARBOR TRUST COMMISSIONERS.

Specification of Pigsty.

Excavate the ground to a depth of 5 inches over the whole of the site, and 2 inches extra for main drains; leave the surface of the ground even to start brick paving. Holes for studs and posts to be excavated to the depth required.

Pave the floor with brick laid on flat on a 2-inch bed of sand, which has been well watered and rammed. Grout all joints with mortar composed of one part of cement to two parts of sand; lay the floor with a fall of 1½ inches in 10 feet to the traverse drain, which is to be laid with a fall into the main drain at back of sty. The main drain to be formed of bricks laid with their length across the drain, and a splayed brick at each side. The traverse drain is 9 inches wide, and formed by sinking the floor bricks slightly.

The story posts are to be of 4-in. x 4-in. jarrah or redgum; all other timber required for framing to be of hardwood. Fence posts of 3 in. x 3 in. jarrah or redgum. Rails, pickets, and gate frames to be of hardwood.

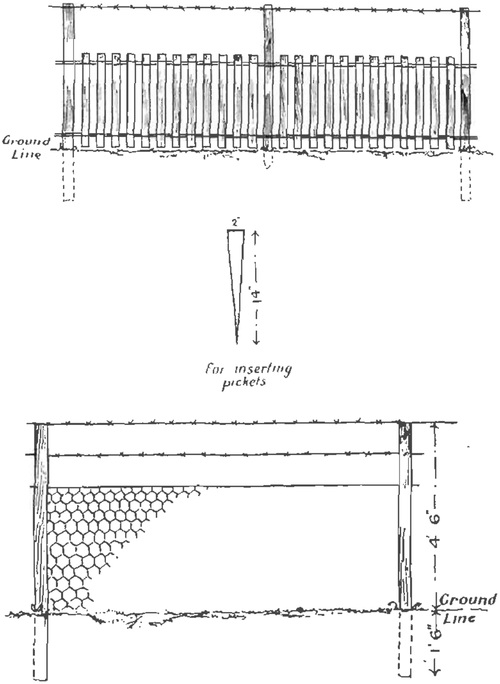
Flap over feeding trough to be constructed of 3-in. x 1-in. hardwood; framing covered with corrugated galvanized iron. Grid to be made of 3-in. x 1-in. hardwood. Cover the roof and framing where shown with 26-gauge corrugated iron, to be secured with 2-inch galvanized screws and washers.

The whole of framing to be checked and fitted in a workmanlike manner, and to be securely fastened with wire nails.

FENCES.

When pigs are kept in runs the question of fencing is one of importance. If the run is of a fair size, of about an acre or more, a wire-netting fence may be satisfactory. The posts may be 6 in. x 3 in. in thickness and 6 feet in length, placed 18 inches in the ground. The distance between the posts 9 or 10 feet, or with two droppers between they may be 27 feet apart. The straining posts should be 2 ft. 6 in. to 3 feet in the ground. Along the bottom of the posts 12-gauge barb wire should be run. Then wire netting 36 inches wide, 17-gauge, and the mesh should not be more than 2½ inches. If it is of coarser mesh the pigs will break through. A plain galvanized wire, No. 8 gauge, may be run along the top of the netting, to which it is fastened either with wire or clips. A barbed wire should be fastened about 6 inches above the netting, and another along the top of the posts, or 2 or 3 inches below.

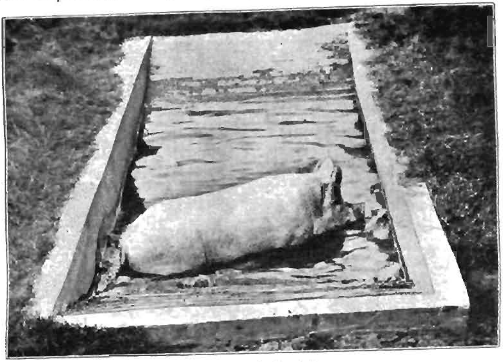
One of the best and cheapest fences for pigs' paddocks is constructed of woven wire and pickets. The posts can be placed 12 feet apart, with a stout stake driven into the ground midway between the posts. In this fence the posts should be 6 ft. 6 in. long and 2 feet in the ground. The



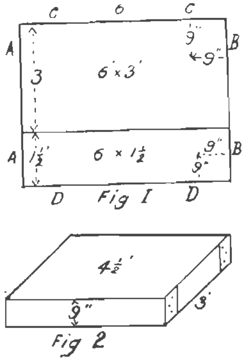
Fencing for Pig Paddocks

method of erection is: First put up four wires, two top and two bottom, and these are best run through holes bored in the posts. Now slip the pickets in between the wires, a pointed instrument, 2 inches in diameter at one end and tapering to nothing at the other, and 14 inches long, being

used to open the wires and knock the pickets into place. It will be found necessary to slacken the wires occasionally as the pickets are being placed in position, consequently they should not be made fast until all



Concrete Bath for Pigs.

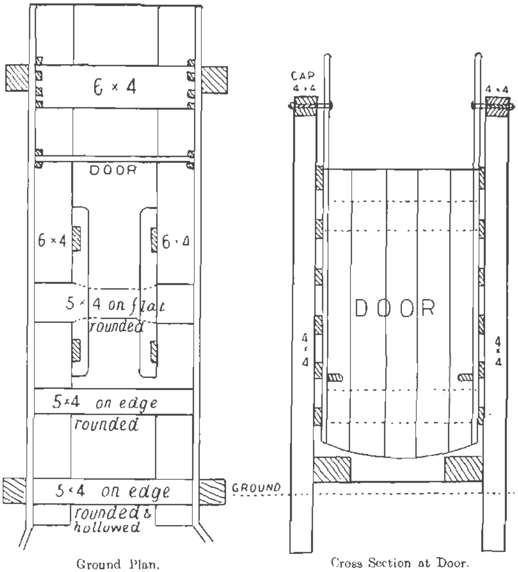


Galvanized Iron Bath for Pigs.

the pickets are in place; they must, however, be kept taut. Take a turn round the end post, and play out the wires as required, or fasten a log of wood at the end, and let it drag as the pickets are woven in. Use

No. 8 galvanized wire. Three feet or 3-ft. 6-in. pickets will do for this fence, with wire, barbed or plain, along the top.

There is a new kind of woven fencing wire on the market, which should be satisfactory for pigs if in the heavy gauge. It is known as "K" woven wire fencing.

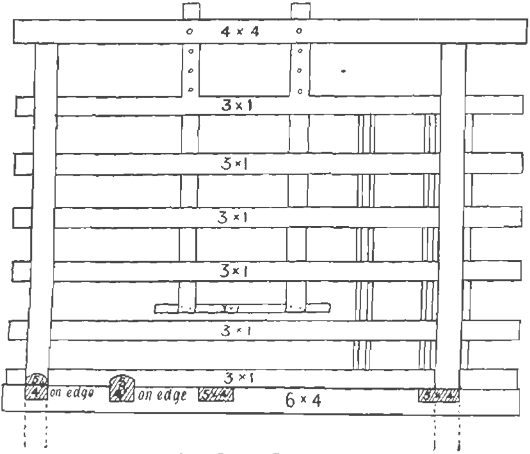


Boar Help, Designed by Mr. W. H. Walker, of Tenterfield.

THE WATER BATH.

Pigs, more than any other animals, are subject to affection by heat. As a safeguard against this water should be available, so that they can wallow in it. If possible, a creek or a dam should be included in the pig paddock. If this is not possible, a bath may be made of concrete. The illustration shown is taken from the work on "Pigs and Their Management," by Mr. H. W. Potts, Principal Hawkesbury Agricultural College. Galvanized iron may also be used for this purpose, and

the bath let into the ground. The one illustrated is 4 ft. 6 in. long by 3 feet wide and 9 inches deep. Plain galvanized iron, 24-gauge, is used. One sheet, 6 feet x 3 feet, and half a sheet, 6 feet x 1½ feet. These are riveted and soldered together. Then, 9 inches from each corner a cut is put into the sheets for 9 inches, as shown by the dotted lines. A line is marked from A to B, and the edges turned up to form the sides 9 inches deep. Lines are drawn from C to D, and the edges turned up to form the ends. The projecting pieces at the corners are bent round and



Side View of Boar Help.

riveted on to the end. The joints require soldering, and 1 inch hardwood boards may be fastened round to protect the edges. About twenty gallons will one-quarter fill the bath, and a little should be placed in daily to replace that lost by evaporation. A small quantity of kerosene in the water will lessen evaporation, and help to keep down vermin.

A BOAR HELP.

The plan given for this in Mr. Potts' book will be found very good, and almost explains itself. The length of the pen is 6 feet and width 2 feet. The rests are made to slide so that the rests may be placed about half way down the sides of the sows. In this way heavy old boars may be used on young sows.

VINEGROWERS' FIELD DAY AT RUTHERGLEN.

A SPLENDID GATHERING.

(From the *Rutherglen Sun.*)

On Friday, 19th March, there was an attendance of about 200 at Viticultural Nursery, Wahgunyah, to view the work that had been carried out during the year. The gathering included growers of the Rutherglen, Barnawartha, Chiltern, Corowa, and Albury districts, and considerable interest was taken in the work. The staff, during the day, had many questions to answer.

The visitors began to arrive at the Nursery shortly after 2 o'clock, and at 2.30 p.m. proceedings were commenced.

Lifting Grafted Rootlings, Wahgunyah Nursery.

Mr. D. B. Smith, chairman of the Vinegrowers' Progress Committee, stated that he was pleased to see such a fine gathering. He extended a welcome to the teachers of the district and their pupils. He thought it was an admirable idea to get the teachers and children to take an interest in one of the principal industries of the district. They were assembled to inspect the work of the college staff for the past year. Mr. Adcock, the principal, and Mr. Wilkinson, the vineyard superintendent, would explain what had been done, and after the inspection Mr. F. de Castella would deliver short addresses. He was pleased that Mr. Richardson, Superintendent for Agriculture, was present, and extended to him a hearty welcome. He also wished to thank the officials for affording growers the opportunity to visit the nursery.

Mr. A. E. V. Richardson, Agricultural Superintendent, stated that, on behalf of the Department, he extended a hearty welcome to all to the

Wahgunyah Nursery, and he was delighted to see such a fine gathering. He trusted that they would be interested in the work in progress. Before the inspection of the nursery took place he wished to say a few words in reference to the work that was being carried out, and what was being done to carry out the promises made when the Honorable the Minister visited the district. During the past season 600,000 phylloxera-resistant stocks, grafted and ungrafted, had been planted, and it was gratifying for him to be able to state that, although there had been a severe drought, at present they had a 60 per cent. strike, and that would give 400,000 grafted vines and ungrafted rootlings for distribution. The department was doing its best to cope with the demands for grafted vines, but one of the difficulties had been the procuring of suitable grafting wood. To overcome this difficulty, a neglected vineyard of mother stocks at Château Tabilk had been grafted, cultivated, and irrigated, and was being brought back to a proper condition. They also had grafted a

Severing Scion Roots, Wahgunyah Nursery.

20-acre vineyard at Violet Town with mother wood, and these should give a good increased supply. A new vineyard of mother wood, comprising 30 acres, had been planted near the college, but for the next year or two they could not expect much off this area. It was the desire of the Department to overtake the demand, and its object was to turn out 1,000,000 grafted vines yearly. This would be sufficient to reconstitute, approximately, 2,000 acres yearly, and they intended to keep that up until the vine-growing industry was brought back to the flourishing condition it was in previous to the outbreak of phylloxera. (Applause.) Growers would notice that the Department had added another branch of work to the nursery, viz., the propagation of citrus trees, but this was not to interfere with the expansion of the viticultural work. This new branch was under the supervision of Mr. Carmody. There had been a big demand from the irrigation areas for citrus trees, and, although as

much as £8 10s. per 100 was offered for trees, intending planters had a difficulty in getting supplies. The Department had decided to provide these trees, and had established a nursery at Wahgunyah, where the soil was suitable for propagation. They would notice that Mr. Carmody had already 25,000 young trees planted out in the nursery, and 100,000 seedlings growing in the seed beds, which were looking well. An addition of 20 acres of land acquired from the trustees of the recreation reserve had been made to the nursery. A new pumping plant for irrigation purposes, with double the capacity of the present plant, was being installed, and the Department was going ahead as fast as the finances of the Treasury would allow. (*Applause.*) He would invite growers to take a walk through the nursery, and Messrs. Adcock, Castella, Carmody, and Wilkinson would give information as to the work.

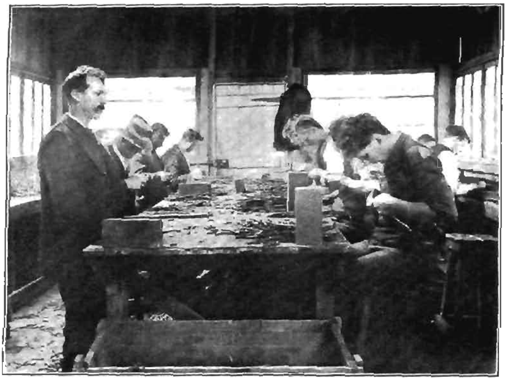
Grafted Rootlings Ready for Distribution, Wahgunyah Nursery.

Mr. G. H. Adcock, Principal of the Viticultural College, stated that he noticed that he was down for an address on the propagation of the vine, but he thought it would be better for him to explain as they walked through the nursery. A lot of the work carried out at the nursery was underground and not on the surface. He thought that the Department was now working on the right lines for the reconstitution of the vineyards.

During the walk through the nursery Mr. Adcock, Mr. Wilkinson, and Mr. Carmody explained to growers the varieties planted in the different beds; also the varieties that they had found best suited to each other. When the young citrus trees plantation was reached there was a general expression of surprise, and the staff was congratulated.

Mr. Carmody, Chief Orchard Supervisor of the Department, said—It may be of interest to learn the reasons for the Department of Agriculture establishing a citrus nursery instead of allowing intending growers

to obtain their supplies from private nurseries. In the first place, owing to the impetus given to the fruit industry through the opening up of suitable areas in northern districts subject to irrigation, a sufficient supply of this class of fruit was not available; and, secondly, the industry did not at its inception enter into competition with any similar industry carried on by private enterprise, as the Department was practically the first in the field in this State, so that growers were compelled to go to New South Wales for their supplies. Under these conditions considerable losses ensued owing to the planting out of unacclimatized trees. Settlers found that the cost of establishing a citrus grove was too great for their resources, and, in order to relieve them to some extent, the Department considered it wise to produce the trees they required under conditions similar to those to which they would be subsequently subject.



Bench Grafting, Wahgunyah Nursery.

At the Wahgunyah Nursery, which was started in September, and is a continuation of the work previously begun at Burwood, there are planted out in the field 25,000 sour orange seedlings, which are doing remarkably well. In addition, there are 100,000 well-grown young seedlings of the same origin in the seed beds, and which will be transplanted after being hardened off in the early spring. These stocks will be ready for budding next autumn. It is as well to understand that the growth of these stocks is much less free than the lemon stock, and the resultant trees will also be not only slower in their growth, but the period of coming into fruit will be later. To compensate for this, however, the trees are considered to be much less susceptible to collar rot under irrigation conditions, so that there is less likelihood of individual trees

dying here and there in the orchard. It must be clearly understood that the accumulated returns are the product of each individual tree, so that if there are many failures in a grove it may become unprofitable to work. Again, it is generally recognised, not only amongst experienced growers of this State, but also by those of California and other countries, where the citrus is extensively cultivated, that trees worked on the sour orange stock have much longer existence than those worked on the lemon, so that persons planting out trees of this character can look forward to years of profit beyond those worked on different lines. It is very pleasing to find that the young orange seedlings have done so extremely well in this district, even under abnormal conditions, and it is but reasonable to expect that in the near future growers will be in a position to obtain trees locally grown, and consequently readily transferable to districts in the northern areas.

When the inspection was over, and when the "direct producers" were reached, Mr. de Castella, Government Viticulturist, explained how these hybrid vines had been raised, so as to combine in one the resistance to phylloxera of the American with the quality of fruit of the European parent. Though complete success has not yet been achieved, since the fruit is not equal to that of the best "viniferas," nor the phylloxera resistance equal to that of our best stocks, notable progress has been made, and many of this group are decidedly interesting. Among the best is Couderc's No. 132-11—a good bearer, whose well-filled bunches of black grapes were still hanging on the vine. Although possessing no foreign flavour, birds do not seem to fancy this vine. It appears to be bird proof! This and several other direct producers are well worth trial on a commercial scale, though caution was advised in view of the undesirability of altering, through too hasty plantation of any new variety, the type of wine for which Rutherglen is now so well known.

A move was then made to the grafting shed, where the Chairman called on Mr. de Castella to describe the behaviour of the leading stocks during the past season.

Mr. de Castella briefly outlined the disastrous weather conditions of the season which has just closed. The rainfall for 1914 was only 14½ inches, of which 4 inches fell in December. Before these December rains the situation appeared to be desperate, and there were most gloomy forebodings. It was feared that the resistant stocks were no longer to be relied on, that they would succumb in their turn, &c. The timely arrival of the December rains and the marvellous response of the vines dispelled these exaggerated fears. Growers soon understood that the resistant stock was not to blame. The vine, whether grafted or ungrafted, needs a certain amount of moisture in the subsoil. Unless this was available it could not prosper. Though the present season would seem to be an ideal one to test the drought resistance of the different stocks, this was not altogether so. The recovery since the rain had been an all-round one, and there were now less marked differences between the different stocks than one might expect. Nevertheless, there were interesting inferences to be drawn, and a thorough inspection of the whole district was being carried out, the results of which would be embodied in a detailed report, which it was hoped might contain information of use to intending planters.

A detailed account of the behaviour of each stock was held over, on the suggestion of the Chairman, for another meeting, as the hour was growing late.

As regards the future, Mr. de Castella was very hopeful; there was no cause for alarm. The recovery of the vines since the December rains has permitted the accumulation of almost normal reserves, which would render possible a fair start next season. Nevertheless, the vines have gone through a very severe trial, and they need a rest cure and a tonic—a rest cure in the shape of much shorter pruning this coming winter, and, as a tonic, liberal manuring. A dressing of at least half a cwt. per acre of nitrate of soda was strongly recommended. Sulphate of ammonia, though cheaper, would not give the same results in our limeless soils. Blood manure would also prove beneficial. Thorough cultivation was also strongly recommended—plough early and plough deep, and cultivate thoroughly afterwards.

Nursery in Primitive State, Wahgunyah.

In conclusion, vineyard owners were reminded of the large quantity of fodder they possessed in the shape of vine prunings. These possess a high food value, and if chaffed and crushed in a cornerusher they would undoubtedly prove capable of saving from starvation very many head of stock. Being somewhat indigestible, they would benefit by mixing with other fodder.

Mr. D. B. Smith stated that the growers were indebted to Messrs. Richardson, Carmody, Adcock, and de Castella for their explanations. He would ask Mr. Richardson to convey to the Honorable the Minister that the growers had no requests to make, and that they were well satisfied with the thoroughness in which Messrs. Adcock, Wilkinson, and the staff were carrying out the work. (Applause.)

GOVERNMENT CERTIFICATION OF STALLIONS.

EIGHTH ANNUAL REPORT (SEASON 1914) ON THE VETERINARY EXAMINATION OF STALLIONS FOR GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

The system of examination of stallions for Government certification having been in operation for a period of eight years, has now become so familiar to all, that it is unnecessary to enter into any description of the steps that led to its introduction. The Table, given at a later stage, analyzing the last season's work will show that a total of 603 stallions was examined. This is the lowest number that has been presented during any previous season, the average over the seven years being 911. This diminution may be taken as a reflex of the number of castrations following the previous season's work, when stallions were sold at below gelding prices. That a large number of these carrying certificates were so dealt with is shown by the fact that, in the season 1913-14, 244 three-year-olds and 229 four-year-olds, or a total of 473 of these ages, were certificated, whilst in the following season, 1914-15, only 85 four-year-olds and 152 five-year-olds, or a total of 237, were presented for re-examination. The lesson was a very salutary one, and breeders could do nothing else than take it to heart and keep only the best of their rising generation of colts, and so a general steadying of the market was brought about. The number of horses introduced from New Zealand, also showing a fall on previous years, indicates that the lesson has been far-reaching.

Table I., showing the imports of horses from Great Britain and from New Zealand:—

FROM NEW ZEALAND.

Year.	Draught Horses.				Light Horses.				Grand Total.
	Stallions.	Mares.	Geldings.	Total.	Stallions.	Mares.	Geldings.	Total.	
1910–11	292	1,786	758	2,836	11	16	10	37	2,873
1911–12	246	452	208	906	12	35	14	61	967
1912–13	173	113	40	326	4	19	9	32	353
1913–14	125	51	6	182	5	9	6	20	202

HORSES FROM GREAT BRITAIN.

Year.	Shires.	Clydesdales.	Thoroughbreds.	Other.	Total.
1910–11 ..	51	4	65	14	134
1911–12 ..	67	38	39	27	171
1912–13 ..	7	3	62	3	75
1913–14 ..	2	7	21	7	37

For the future it can confidently be said that the outlook is a bright one for breeders. The drought experienced has been responsible for serious losses, while the wastage amongst the light breeds, on account of war, will all have to be made good. Some difficulty is always experienced in gauging the supply for the horse market, for the reason that a period of at least three years must elapse before a supply can be bred, by which time the demand may, for various reasons, have become slack. In this way there is a constant pendulum-like movement maintained. If the supply is of fair average quality the pendulum does not swing too far in either way, but when the market is flooded with a nondescript lot the fall is severely felt. Breeders, therefore, should remember the lesson of the past few years, and for the future prevent a repetition of "boom" and "fall" by an endeavour to uplift the standard. This can be done by careful consideration of the laws of breeding, more particularly in regard to the quality of the sire used.

During last season the number of parades held was 143, and a word of thanks is due to the Veterinary Staff for the able way in which all engagements were kept during a very strenuous period, covering, as it did, the proclamation of war and the shortening of the staff by enlistment for service, and my own absence from Melbourne. This necessitated calling upon Mr. Norman MacDonald to assist in the work, with which he was already familiar, having been in the service of the Department during the early years of examination.

The accompanying table shows the number of horses examined and the actions taken by the individual officers concerned in the examination during the past season:—

Officer.	Number Examined.	Number Certificated.	Number Rejected.	Per cent. Rejected.
Mr. R. Griffin, M.R.C.V.S.	227	144	83	36·56
Mr. R. N. Johnstone, B.V.Sc. ...	245	166	79	32·24
Mr. G. Heslop, B.V.Sc. ...	43	34	9	20 93
Mr. R. J. de C. Talbot, L.V.Sc. ..	61	39	22	36·06
Mr. N. McDonald, B.V.Sc.	21	13	8	38·09
Appeal Boards	6	1	5	83·33
Totals	603	397	206	34·16

EXAMINATIONS AND REJECTIONS.

Of the number of stallions examined, viz., 603, 34.16 per cent. were refused certificates. This is a slight increase on the figures for the previous year, when 30.53 per cent. were rejected. A study of the table following, showing the analysis of the season's work, will show that the difference is almost entirely due to rejections on account of unsoundness, and of the unsoundnesses, sidebone is seen to be responsible, for 8.29 per cent. were refused on this account, as against 6.44 per cent. in 1913. There are no other variations in the results calling for comment.

ANALYSIS OF DEFECTS OF REJECTS, SEASON 1914-15.

—	Draughts.		Lights.		Ponies.		Totals.	
	Examined. 400	Certificated. 267	Examined. 121	Certificated. 75	Examined. 82	Certificated. 55	Examined. 603	Certificated. 397
	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.	Rejected.	Per cent. Rejects.
Unsoundness.								
Bog Spavin ..	..	..	...	...	...	...	...	...
Bone Spavin	1	·25	5	4·13	5	6·10	11	1·82
Cataract ...	1	·25	...	...	...	...	1	·16
Chorea (shivering)	1	·25	...	...	..	.	1	16
Curb ...	1	·25	5	4·13	1	1·22	7	1 16
Navicular Disease	...	...	...	..	..	...	...	.
Nasal Disease	...	...	...	...	...	..		..
Ringbone ...	3	·75	2	1·65	.	.	5	·83
Roaring ..	3	·75	1	·83	.	.	4	·66
Sidebone ..	50	12·50		..	..	.	50	8·29
Stringhalt ..	1	·25	1	·83	1	1·22	3	·50
Thoroughpin	..	..	...	...	.	.	...	...
Whistling ...	1	·25	..	...	..	..	1	·16
Total unsoundnesses	62	15·5	14	11·57	7	8·54	83	13 76
Disapproved	71	17·75	32	26 45	20	24·39	123	20·40
Total rejected	133	33·25	46	38·02	27	.2·93	206	34·16

Re-examination.—Two hundred and forty-eight horses, previously holding certificates, were presented for re-examination, as below:—

HORSES SUBMITTED FOR RENEWAL OF CERTIFICATES 1914-1915.

Reasons for Rejection.	3 years.		4 years.		5 years.		Totals.	
	Examined. 11	Certificated. 9	Examined. 85	Certificated. 72	*Examined.* 152	Certificated. 107	*Examined.* 248	Certificated. 188
	Rejected.	Per cent. rejects.	Rejected.	Per cent. rejects.	*Rejected.*	Per cent. rejects.	Rejected.	Per cent. rejects.
Disapproval	2	18·18	5	5·88	18	11·84	25	10·08
Sidebone ..	..	..	7	8·23	19	12·50	26	10·48
Ringbone ..	..	..	..	..	2	1·31	2	·81
Curb ..	..	..	1	1·18	1	·66	2	·81
Spavin ..	..	..	..	..	3	1·97	3	1·21
Roaring ..	..	..	..	..	1	·66	1	·40
Cataract ..	..	..	..	..	1	·66	1	·40
Total rejections	2	*18·18*	13	*15·29*	45	29·60	60	24·19

Horses included in the above table are those which held, respectively, two, three, and four-year-old expired certificates, and, as previously pointed out, while in 1913 a total of 473 three and four year-olds were certificated, only 237 came up for re-examination last season. The greater part of the balance, 236, is probably accounted for by castrations and deaths; but that there are 236 expired certificated in the one season's operations which have not been presented to the Department should make users of stallions and probable purchasers careful to examine all certificates that are held out as an inducement to business.

TRANSFERRED CERTIFICATES.

The number of certificates presented for transfer for Victorian Government Certificates is as follows:—

New Zealand	31
New South Wales	2
South Australia	1
Total	34

In addition to the above, a few certificates issued in other States were indorsed for recognition at Victorian shows. These were as follows:—

New South Wales	3
South Australia	3
Tasmania	1
Total	7

APPEALS.

The number of appeals lodged against rejection by Government officers was six, of this number four on the question of disapproval as regards type and conformation, and two as regards unsoundness. The boards, appointed in due course, to deal with these cases upheld the action of the officers in five of the cases, and recommended the issue of a certificate in the sixth.

TIME TABLE FOR COMING SEASON.

The time table published herewith of parades for the coming season is based, as near as possible, on the work of other years and upon the wishes of agricultural societies. It is hoped that the times as arranged will be kept; but it must be pointed out that, on account of the depletion of the Veterinary Staff for military services, it will be a matter of some difficulty, and circumstances may arise which will necessitate considerable alteration, and possibly reduction, in the number of parades. Agricultural societies have already been notified to such effect, and it is pleasing to record that all, appreciating the difficulty, are prepared to fall in with any alterations it may be found necessary to make. It would, therefore, be wise for breeders who have stallions to submit for examination to watch all local announcements on the subject.

Summary of Eight Years' Work, 1907–1914.

Season.	Draughts. Examined.	Draughts. Certificated.	Draughts. Rejected.	Draughts. Percentage.	Lights. Examined.	Lights. Certificated.	Lights. Rejected.	Lights. Percentage.	Ponies. Examined.	Ponies. Certificated.	Ponies. Rejected.	Ponies. Percentage.	Totals. Examined.	Totals. Certificated.	Totals. Rejected.	Totals. Percentage.
1907–8 ..	403	271	Unsound 96	23·82	301	246	Unsound 32	10·63	214	186	Unsound 10	4·67	918	703	Unsound .. 138	15·04
			Disapproved 36	8·93			Disapproved 23	7·64			Disapproved 18	8·41			Disapproved 77	8·38
			132	32·75			55	18·27			28	13·08			215	23·42
1908–9 ..	501	341	Unsound 137	27·33	295	242	Unsound 29	9·83	199	159	Unsound 5	2·5	995	742	Unsound .. 171	17·17
			Disapproved 23	4·59			Disapproved 24	8·13			Disapproved 35	17·58			Disapproved 82	8·24
			160	31·92			53	17·96			40	20·10			253	25·41
1909–10 .	410	275	Unsound 96	23·52	191	147	Unsound 12	6·27	156	112	Unsound 5	3·29	757	534	Unsound .. 113	15·04
			Disapproved 39	9·56			Disapproved 32	16·77			Disapproved 39	25·65			Disapproved 110	14·65
			135	33·08			44	23·04			44	28·94			223	29·09
1910–11 ..	542	387	Unsound 117	21·57	143	108	Unsound 15	10·53	128	101	Unsound 7	5·47	813	596	Unsound .. 139	17·09
			Disapproved 38	7·01			Disapproved 20	14·08			Disapproved 20	15·62			Disapproved 78	9·6
			155	28·58			35	24·61			27	21·09			217	26·69
1911–12	692	554	Unsound 84	12·13	165	120	Unsound 13	7·87	122	83	Unsound 5	4·09	979	758	Unsound .. 102	10·42
			Disapproved 54	7·8			Disapproved 31	18·78			Disapproved 34	27·86			Disapproved 119	12·15
			138	19·94			44	26·66			39	31·96			221	22·57
1912–13 ..	745	597	Unsound 89	12·03	139	106	Unsound 19	13·67	70	43	Unsound 2	2·85	954	746	Unsound .. 110	11·59
			Disapproved 59	7·92			Disapproved 14	10·07			Disapproved 25	35·71			Disapproved 98	10·27
			148	19·73			33	23·74			27	38·57			208	21·81
1913–14 ..	718	507	Unsound 79	11·0	157	102	Unsound 16	10·19	88	60	Unsound 5	5·68	963	669	Unsound 100	10·38
			Disapproved 132	18·38			Disapproved 39	24·84			Disapproved 23	26·14			Disapproved 194	20·14
			211	29·39			55	35·03			28	31·82			294	30·53
1914–15 ..	400	267	Unsound 62	15·50	121	75	Unsound 14	11·57	82	55	Unsound 7	8·53	603	397	Unsound .. 83	13·76
			Disapproved 71	17.75			Disapproved 32	26·44			Disapproved 20	24·39			Disapproved 123	20·40
			133	33·25			46	38·01			27	32·92			206	34·16

REGULATIONS

Governing the Examination of Stallions for the Government Certificate of Soundness and Approval.

I.—Examination Parades.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the Stallion owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations of Stallions for the Government Certificate will be made at such Parades or on some such publicly advertised occasion, *unless* under special circumstances as provided for in clause 5.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June*, after which no alteration in the Time Table can be made.

(5) The special examination of stallions for the Government Certificate of Soundness at other than the advertised stallion parades may be arranged for in cases where, through accidental circumstances, the owner has failed to submit the horse at such parade.

Such examinations will only be arranged when the attendance of the Examining Officer will not interfere with the requirements of the Department for his services in other directions.

An owner requesting such special examinations will be required to prepay a fee of £1 1s. for each horse examined; also the railway fare (first class return), and travelling expenses at the rate of 14s. per day, of the visiting officer.

II.—Grounds for Rejection.

(1) Refusal of Certificate on the ground of unsoundness will be made only when, in the opinion of the Examining Officer, the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses, viz.:—

Bog Spavin	Ringbone
Bone Spavin	Roaring
Cataract	Sidebone
Chorea "*Shivering*" or "*Nervy*"	*Stringhalt*
Curb	Thoroughpin
Navicular disease	Whistling
Nasal disease (Osteo-porosis)	

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of

the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) For the purpose of these regulations the following shall be the definitions of "Ringbone," "Sidebone," and "Curb":—

(a) Any exostosis on the antero or lateral aspect of the phalanges below the upper third of the *Os Suffraginis* shall constitute a Ringbone;

(b) Any ossification of the lateral cartilage shall constitute a Sidebone;

(c) Any circumscribed swelling on the posterior aspect of the hock in the median line and within the limits of the lower third of the hock and the head of the metatarsal bones shall constitute a Curb.

(3) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation, and breeding.

(4) Stallions three or four years old, which are refused a Certificate as regards type, conformation, and breeding may be re-submitted annually until five years old, after which the refusal shall be subject to review under Part V. of these regulations only.

(5) In the case of horses that have been rejected for any reason whatsoever, a notification containing all particulars of identification shall be sent to all Chief Veterinary officers of the other States of the Commonwealth as early as practicable after such examination has taken place.

III.—CERTIFICATES.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the owner direct. Secretaries of Societies under whose auspices the Parade is held will be notified which, if any, of the horses submitted for examination obtain their Certificates.

(3) The owners of stallions for which a Certificate is refused will within seven days of such refusal be officially notified of the fact; the reason for such rejection will also be given.

(4) Until the issue of a Certificate, or until the publication of the official list of certificated stallions, the result of the Veterinary examination will not be communicated to any person except as herein provided or under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the Certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless

they deliver to the officer the owner's signed authority to receive the information.

(5) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The Government Certificate of Soundness of any Australian State or New Zealand.

The Veterinary Certificate of the Royal Shire Horse Society (England).

The Veterinary Certificate of Royal Agricultural Society (England).

The Veterinary Certificate of Royal Dublin Society (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland).

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society.

The Veterinary Certificate of the Board of Agriculture and Fisheries (England).

The Veterinary Certificate of the Board of Agriculture (Scotland).

Provided that such horses have been examined in accordance with these regulations.

Any horse which has been rejected by the Veterinary Examiners for any of the above certificates will not be eligible for examination for the Victorian Government Certificate of Soundness.

(6) The form of the Victorian Government Certificate of Soundness is as follows:—"G.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion (*name and description of stallion*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Secretary for Agriculture."

(7) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

(8) The season in respect of Government Certificates shall be considered as opening on 1st July. Stallions passing the examination any

time during the three months previous to this date in New Zealand or Australia will be granted a Certificate for the season next following. In respect of stallions examined in Great Britain examinations on or after 1st January will be considered as examinations for the following season.

IV.—TENURE OF CERTIFICATE.

(1) Certificates issued during the season in respect of horses five years old and over are life certificates; those for three-year-olds and four-year-olds are season certificates only, and such horses must be submitted for re-examination at four and five years before a life certificate will be issued.

(2) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(3) The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

V.—BOARD OF APPEAL.

(1) Any owner of a stallion who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against, to be free from all the unsoundnesses set out in Part II. of these regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of:—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and not subject to review.

(3) In the event of the appeal being allowed, refund shall be made of the deposit, and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal or in such case as when a three or four years old stallion has been refused on account of type as herein provided for. In the event of any rejected stallion being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected stallion, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

NOTICE TO SECRETARIES OF AGRICULTURAL SOCIETIES.

Section "A" of the conditions to be complied with by Agricultural Societies before being eligible for participation in the annual Government grant is as follows:—

> "*A.—That the awards of prizes in all classes for stallions, three years old and over, at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.*"

In order to comply with the above, the special attention of show secretaries is invited to the receiving of entries in stallion classes. No entry should be received unless at the time of entry the Government certificate is produced, or unless satisfactory evidence is given that a Government certificate is held by the owner in respect of the exhibit. The awarding of a prize card and the withholding of prize money in respect of any exhibit shall not be deemed as compliance with the condition. Care should be taken also to see that the certificate is not out of date, that is to say:—

For three-year-olds, a 1915 three-year-old certificate must be held.

For four-year-olds, a 1915 four-year-old certificate must be held (the 1914 certificates are out of date).

For horses five years old and over, a life certificate must be held.

Horses holding Government certificates issued by any other State are not eligible to compete at shows unless such certificate is endorsed by the Victorian Department, "Recognised for Victorian Shows."

Particular attention is directed to the method now in vogue of classifying certificated stallions. The list is now divided into horses carrying a life certificate and those which are terminable, and supplementary lists will be issued annually which should be added to those listed in Bulletin No. 30, No. 17, and No. 24 (New Series)

Secretaries are strongly urged to become familiar with the regulations, particularly Regulation IV., which deals with the tenure of certificates.

Secretaries are required to *forward immediately after the show* a return (forms for which will be sent to each society) giving required particulars concerning 1st, 2nd, and 3rd prize winners as under:—

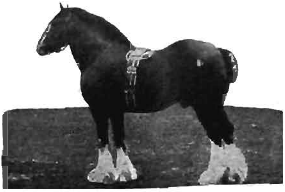
RETURN to be forwarded to the Chief Veterinary Officer concerning Stallions (three years old and over) awarded Prizes at the .... Agricultural Society's Show held ....

Name of Stallion.	Certificate Number.	Name of Class and Section (not Number).	Prize Awarded.			Owner's Name.	Owner's Address.
			1st.	2nd.	3rd.		

(*Signed*) ....

Secretary .... Agricultural Society.

Date ....



STALLION PARADES.

TIME TABLE

(Subject to alteration on short notice.)

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
SPECIALS.				
June 26 to Dec. 31 ..	Agricultural Offices	10 a.m. to 12 noon		
July 7 to July 10 .	Horsham ..	10 a.m. ..		
July 14	Hamilton ..	2 p.m. ..	12.57 a.m. ..	5.30 a.m. (15th)
July 15	Balmoral ..	2 p.m. ..	11.30 a.m. ..	11 a.m. (16th)
July 19 to July 23 ..	City Horse Bazaar	10 a.m. ..		
July 29	Bendigo ..	1.30 p.m.	11.20 a.m. ..	3.15 p.m.
July 26 to July 31 ..	Royal Show Grounds	10 a.m. ..		
MALLEE No. 1.				
July 20	Quambatook	9.30 a.m.	6.35 p.m. (19th)	10.47 a.m.
July 20	Boort ..	3 p.m. ..	12.12 p.m. ..	6 10 a.m. (21st)
July 21	Charlton ..	2 p.m. ..	9.17 a.m. ..	4.28 p.m.
July 22 .. .	Sea Lake ..	3 p.m. ..	9.55 p.m. (21st)	6.40 a.m. (23rd)
July 23	Wycheproof	10 a.m. ..	10 a.m. ..	11.20 a.m.
WIMMERA No. 1.				
July 19	Beaufort ..	2 p.m. ..	12.27 p.m. ..	8.35 p.m.
July 20	Dimboola ..	1.30 p.m.	12.4 a.m. ..	3.20 p.m.
July 21	Murtoa ..	2 p.m. ..	5.50 p.m. (20th)	4.30 p.m.
July 22	Beulah ..	2 p.m. ..	7.57 p.m. (21st)	8.15 p.m.
July 23	Hopetoun ..	9.30 a.m.	9.15 p.m. (22nd)	10.50 a.m.
WIMMERA No. 2.				
July 21 .. .	Goroke ..	3.10 p.m.	3.10 p.m. ..	6.30 a.m (22nd)
July 22	Edenhope ..	3 p.m. ..	12 noon ..	1.30 p.m. (23rd)
MALLEE No. 2.				
August 2	Castlemaine	3 p.m. ..	10.20 a.m. ..	10.38 a.m. (3rd)
August 3	St. Arnaud	3.30 p.m.	3.22 p.m. ..	11.45 p.m.
August 4	Donald ..	2 p.m. ..	12.34 a.m. ..	6 p.m.
August 5	Watchem ..	2 p.m. ..	7.27 p.m. (4th)	7.10 p.m.
August 6	Birchip ..	11 a.m. ..	7.45 p.m. (5th)	1.37 p.m.
NORTH-EASTERN No. 1.				
August 2	Rutherglen	2 p.m. ..	1.48 p.m. ..	3.22 p.m.
August 3	Yarrawonga	11 a.m. ..	10.5 p.m. (2nd)	2.45 p.m.
August 3	Tungamah	3.30 p.m.	3.26 p.m. ..	8.6 a.m. (4th)
August 4	Myrtleford	3 p.m. ..	2.54 p.m. ..	7.22 a.m. (5th)
August 5	Wangaratta	2 p.m. ..	9.18 a.m. ..	4.37 p.m.
August 6	Benalla ..	2 p.m. ..	5.20 p.m. (5th)	5.40 p.m.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
WIMMERA No. 3.				
August 3	Ararat ..	3 p.m. ..	1.29 p.m. ..	8.30 p.m.
August 4	Stawell ..	11 a.m.	9.25 a.m. (3rd)..	2.48 p.m.
August 5	Minyip ..	2 p.m. ..	5.2 p.m. (4th) .	5.2 p.m.
August 6	Warracknabeal	9.30 a.m.	5.52 p.m. (5th)	11.15 a.m.
MALLEE No. 2.				
August 9 .. .	Pyramid ..	3 p.m. ..	2.15 p.m. ..	2.15 p.m. (10th)
August 11	Swan Hill ..	2 p.m. ..	5.31 p.m. (10th)	12 noon (12th)
August 12	Kerang ..	2.30 p.m.	1.39 p.m. ..	6 a.m. (14th)
August 13	Elmore .	2 p.m. ..	1.11 p.m. ..	5.20 p.m.
GOULBURN VALLEY No. 1.				
August 9 .. .	Dookie ..	2 p.m. ..	12.45 p.m. ..	4.5 p.m.
August 10	Cobram ..	2 p.m. ..	10.52 p.m. (9th)	3.10 p.m.
August 11	Numurkah ..	11 a.m. ..	4.28 p.m. (10th)	12.50 p.m.
August 11	Nathalia ..	1.30 p.m.	1.25 p.m. ..	3.25 p.m.
August 12 .. .	Shepparton..	2 p.m. ..	5.29 p.m. (11th)	5.49 p.m.
August 13 .. .	Murchison ..	9.30 a.m.	7.52 p.m. (12th)	10.58 a.m.
August 13	Rushworth	2 p.m. ..	11.48 a.m. ..	5.20 p.m.
NORTH-EASTERN No. 2.				
August 9	Seymour ..	3 p.m. ..	9.9 a.m.	8.33 p.m.
August 10	Yea ..	9.30 a.m.	10.26 p.m. (9th)	10.33 a.m.
August 10	Mansfield ..	2 p.m. ..	1.50 p.m. ..	3.30 p.m.
August 11 .. .	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
August 12	Geelong ..	3 p.m. ..	12.49 p.m. ..	5.45 p.m.
August 13	Frankston ..	3 p.m.	2.38 p.m. ..	5.40 p.m.
GOULBURN VALLEY No. 2.				
August 16	Heathcote ..	2 p.m. ..	11.41 a.m. ..	8.17 p.m.
August 17	Rochester ..	2 p.m. ..	1.36 p.m. ..	9.44 p.m.
August 18	Echuca ..	1 p.m. ..	10.13 p.m. (17th)	2.55 p.m.
August 19	Tatura ..	10 a.m. ..	5.36 p.m. (18th)	11.42 a.m.
August 19	Kyabram ..	2 p.m. ..	12.50 p.m. ..	4.20 p.m.
August 20	Euroa ..	2 p.m. ..	10.24 a.m. ..	6.33 p.m.
WESTERN No. 1.				
August 18	Coloraine ..	10 a.m. ..	6.45 p.m. (17th)	11 a.m. (Driving)
August 18	Casterton ..	3 p.m. ..	1 p.m. (Driving)	8.35 a.m. (19th)
August 19	Portland ..	2 p.m. ..	1.6 p.m. ..	2.55 p.m.
August 20	Port Fairy ..	11 a.m. ..	12.19 a.m. ..	1.30 p.m.
WIMMERA No. 4.				
August 17	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (18th)
August 18	Nhill ..	2 p.m. ..	1.24 a.m. ..	1.34 a.m. (19th)
August 19	Rainbow ..	1 p.m. ..	11.55 a.m. ..	2.40 p.m.
August 20	Jeparit ..	2 p.m. ..	3.50 p.m. (19th)	9.53 p.m.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
MALLEE No. 3				
August 23	Clunes ..	1.45 p.m.	1.42 p.m. ..	3 p.m.
August 24	Mildura ..	2 p.m. ..	7.20 a.m. ..	8 a.m. (25th)
August 25	Ouyen ..	2 p.m. ..	10.30 a.m. ..	10.20 p.m.
CENTRAL No. 1.				
August 26	Maryborough	2 p.m. ..	10 a.m. ..	6.5 a.m. (27th)
August 27	Inglewood ..	11 a.m. ..	8.40 a.m. ..	2.10 p.m.
WESTERN No. 2.				
August 23	Terang ..	2 p.m. ..	12.44 p.m. ..	9.53 p.m.
August 24	Penshurst ..	2 p.m. ..	10.15 a.m. ..	4.50 p.m.
August 25	Camperdown	2 p.m. ..	8.46 a.m. ..	9.18 p.m.
August 26	Warrnambool	2 p.m. ..	10.58 p.m. (25th)	7.11 a.m. (27th)
August 27	Colac ..	2 p.m. ..	10.9 a.m. ..	5.55 a.m. (28th)
August 28	Werribee ..	10 a.m. ..	8.56 a.m. ..	1.36 p.m.
NORTH-EASTERN No. 3.				
August 23	Tallangatta	4.40 p.m.	4.35 p.m. ..	5 a.m. (24th)
August 24	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (25th)
GIPPSLAND No. 1.				
August 30	Mirboo ..	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
August 31	Morwell ..	10 a.m. ..	5.55 p.m. (30th)	11.57 a.m.
August 31	Traralgon ..	2 p.m. ..	12.10 p.m. ..	12.20 p.m. (1st)
September 1 ..	Bairnsdale	3.30 p.m.	3.25 p.m. ..	5.40 a.m. (2nd)
September 2 ..	Maffra ..	2 p.m. ..	7.14 a.m. ..	7.18 a.m. (3rd)
September 3 ..	Bunyip ..	2 p.m. ..	11.25 a.m. ..	4.24 p.m.
September 4 ..	Molton ..	11 a.m. ..	8.41 a.m. ..	1.21 p.m.
GIPPSLAND No. 2.				
August 30	Ballan ..	10 a.m. ..	10 a.m. ..	12.7 p.m.
August 31	Bacchus Marsh	2 p.m. ..	12.39 p.m. ..	9.8 p.m.
September 1 ..	Dandenong	3 p.m. ..	2.20 p.m. ..	5.19 p.m.
September 2 ..	Berwick ..	11 a.m. ..	5.42 p.m. (1st) ..	1.1 p.m.
September 2 ..	Warragul ..	3 p.m. ..	2.37 p.m. ..	10.45 a.m. (3rd)
September 3 ..	Trafalgar ..	2 p.m. ..	11.16 a.m. ..	6.51 p.m.
GIPPSLAND No. 3.				
September 6 ..	Lang Lang ..	2 p.m. ..	9.26 a.m. ..	7.3 p.m.
September 7 ..	Dalyston ..	2 p.m. ..	10.49 a.m. ..	4.20 p.m.
September 8 ..	Korumburra	2 p.m. ..	8.7 p.m. (7th) ..	6.34 p.m.
September 9 ..	Yarram ..	9.30 a.m. ..	9 a.m. ..	11.30 a.m.
September 9 ..	Foster ..	3 p.m. ..	2.1 p.m.	6.5 a.m. (10th)
September 10 ..	Leongatha	2 p.m. ..	7.20 a.m. ..	3.56 p.m.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
CENTRAL No. 2.				
September 6 ..	Mernda ..	2 p.m. ..	12.24 p.m.	8.23 p.m.
September 7 ..	Kyneton ..	3 p.m. ..	2.55 p.m. ..	8.32 a.m. (8th)
September 8 ..	Daylesford ..	2 p.m. ..	11.59 a.m. ..	7.8 a.m. (9th)
September 9 ..	Smeaton ..	2 p.m. ..	9.50 a.m. ..	4.30 p.m.
September 10 ..	Ballarat ..	12 noon ..	6.35 p.m. (9th)	7.10 p.m.
SPECIAL.				
September 13 ..	Lilydale ..	2 p.m. ..	1.35 p.m. .	5.20 p.m.
September 16 ..	Kilmore ..	2 p.m. .	9.8 a.m. ..	8.40 p.m.
Sept. 20 to Sept. 25 ..	Royal Show			
September 29 ..	Romsey ..	2 p.m. ..	9.45 a.m. ..	5.25 p.m.
October 5	Orbost ..	3 p.m. ..	2 p.m.	8 a.m. (6th)
October 6	Omeo ..	3 p.m. ..	6.30 p.m. (5th)	6.30 a.m. (7th)

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS.			
2663	Abbot's Pride ..	5 years	A. Robertson ..	Royal Show *Grounds*	20.7.14	R.N.J
2646	Admiral Nelson ..	5 years	J. Jeffrey ..	Numurkah ..	8.7.14	R.N.J
—	Agitation	Aged	J. Ball	New South Wales Examination	3.4.14	..
2715	Agitator's Heir ..	5 years	J. Langford ..	Kerang	13.8.14	R.N.J.
2658	Atlas	5 years	R. C. Hannah ..	City Horse Bazaar	15.7.14	R.N.J.
2684	Baron Black ..	5 years	G. Young ..	Murtoa	29.7.14	G.H.
2740	*Baron Brilliant* ..	*5 years*	*J. Archibald* ..	*Kyabram* ..	*20.8.14*	*R.N.J.*
2712	Baron Laddie ..	5 years	A. McLennan ..	Heathcote ..	4.8.14	R.N.J.
2722	Baron Lough ..	5 years	Gerrard Bros. ..	Seymour ..	11.8.14	N.McD
2751	Baron Watson ..	5 years	W. T. Manifold ..	Camperdown ..	26.8.14	R.G.
2797	Barony	5 years	A. G. Hunter ..	Seymour ..	9.10.14	Appeal Board
2665	Bay Knight ..	6 years	F. Howell ..	Royal Show *Grounds*	20.7.14	R.N.J.
2679	Bonnie McFarlane ..	5 years	A. Robertson ..	Royal Show Grounds	20.7.14	R.N.J.
2739	Briton Again ..	5 years	G. L. Claxton ..	Tatura	20.8.14	R.N.J.
2686	Briton's Pride ..	5 years	A. Cameron ..	Edenhope ..	30.7.14	R.N.J.
2795	Brookdale ..	5 years	J. T. Poynton ..	Ensay Special Exam.	6.10.14	R.J.T.
2747	*Champion* ..	*5 years*	*H. Lee*	*Clunes*	*24.8.14*	*R.N.J.*
2706	Coronation ..	5 years	O'Donnell Bros. ..	Shepparton ..	13.8.14	R.G.
2723	Dominition ..	5 years	A. Arnold ..	Warracknabeal ..	7.8.14	G.H.
2764	Donald Mac ..	5 years	W. J. Craig ..	Dalyston ..	31.8.14	R.N.J.
2667	Drysdale	5 years	E. Roberts ..	Royal Show Grounds	20.7.14	R.N.J
2647	Duncraig Again ..	5 years	A. Dunning ..	Newmarket ..	8.7.14	R.N.J
2710	*Dundonald* ..	*5 years*	*J. Adams* ..	*Swan Hill* ..	*12.8.14*	*R.N.J.*
2689	Dundonald's Chief ..	5 years	H. Doherty ..	Tungamah ..	3.8.14	R.G.
2659	Dunedin	5 years	G. Burrows ..	City Horse Bazaar	13.7.14	R.N.J.
2716	Dunrobin's Pride ..	5 years	T. Sutherland ..	Kerang	13.8.14	R.N.J.
2668	Dunsby Friar II. ..	5 years	G. Stokes ..	Royal Show Grounds	20.7.14	R.N.J.
2730	Eaton Combination	5 years	F. Gerdts ..	Hamilton ..	18.8.14	R.G.
2687	*Federation's Pride* ..	*5 years*	*F. R. Burns* ..	*Goroke*	*29.7.14*	*R.N.J.*
2669	Flowerdale ..	5 years	E. Roberts ..	Royal Show Grounds	20.7.14	R.N.J.
2670	Flowerdale Prince ..	5 years	M. Darcy ..	Royal Show Grounds	20.7.14	R.N.J.
2655	Gay Gordon ..	5 years	F. Gollasch ..	City Horse Bazaar	13.7.14	R.G.
2724	General McDonald ..	5 years	J. Vickers ..	Elmore	14.8.14	R.N.J.
2648	Glen Gairn ..	5 years	J. MacGregor ..	Numurkah ..	8.7.14	R.N.J.
2779	Gowan Brae ..	5 years	R. I. Argyle ..	Kyneton ..	8.9.14	R.G.
2671	Harry Lauder ..	5 years	Mrs. L. Andrews	Royal Show Grounds	20.7.14	R.N.J.
2737	*Hero*	*5 years*	*Cain Bros.* ..	*Echuca*	*19.8.14*	*R.N.J.*
2677	Hiawatha of New Zealand	5 years	H. Coonan ..	New Zealand Exam.	29.6.14	..
2641	Highland Chief ..	5 years	Noske Bros. ..	Horsham ..	30.6.14	R.G.
—	Invincible ..	5 years	J. McGregor ..	South Australian Exam.	7.7.13	..
2636	John O'Groat ..	5 years	W. Walter ..	Agricultural Offices	30.5.14	R.G.
2745	*Karamu Glen Markie*	*5 years*	*M. McCormack* ..	*Mansfield* ..	*28.8.14*	*R.J.T.*
2776	King's Own ..	5 years	J. Denham ..	Mirboo North ..	31.8.14	R.G.
2705	Laird O'Gowrie ..	5 years	J. Harper ..	Murchison ..	14.8.14	R.G.
2792	Laird of Lochiel ..	5 years	O'Neill Bros. ..	Orbost	6.10.14	R.G.
2702	Legislator ..	5 years	W. H. Ludemann	Dookie	10.8.14	R.G.
2672	Lilburne Regent ..	5 years	Jno. Hargreaves ..	Royal Show Grounds	20.7.14	R.N.J.
—	*Locksley*	*Aged*	*W. Potter* ..	*South Australian Exam.*	*20.8.10*	..
2696	Lord Albyn ..	5 years	R. Sweetman ..	Minyip	6.8.14	G.H.
2678	Lord Linden ..	5 years	H. Bodey ..	New Zealand Exam.	27.6.14	..
2657	Lord Nelson ..	5 years	E. J. Brown ..	City Horse Bazaar	13.7.14	R.G
2758	Lord Plunton ..	5 years	J. James ..	Colac	28.8.14	R.G
2794	*Lord Robert* ..	*Aged*	*J. Todd* ..	*Omeo*	*7.10.14*	*R.J.T.*
2783	Lord Ronald ..	5 years	E. J. Rickey ..	Royal Show Grounds	21.9.14	R.J.T.
2731	Lord Shepherd ..	5 years	Noske Bros. ..	Hamilton ..	18.8.14	R.G.
2660	McGregor Again ..	5 years	G. Stokes ..	City Horse Bazaar	13.7.14	R.N.J.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS—continued.			
2637	Major Dale ..	5 years	J. R. McKenzie	Glenroy Special ..	11.6.14	R.G.
2775	Major Oates ..	5 years	Dept. of Agriculture	Werribee ..	29.8.14	R.G.
2649	Marshal Mills ..	5 years	Graham Bros. ..	Newmarket ..	8.7.14	R.N.J.
2735	Nailstone Buchanan	6 years	F. G. Allan and Son	Nhill	19.8.14	G.H.
2643	Newton Lad ..	5 years	P. Rogers ..	Horsham ..	30.6.14	R.N.J.
2753	Oakland's *Pride* ..	Aged	*T. Dowsley* ..	Ouyen	26.8.14	R.N.J.
2707	Onward O.. ..	5 years	Exors. late R. Currie	Shepparton ..	13.8.14	R.G.
2650	Politician	5 years	N. Sutcliffe ..	Numurkah ..	8.7.14	R.N.J.
2673	*Premier Massey* ..	*5 years*	*J. Blair* ..	*Royal Show Grounds*	*20.7.14*	*R.N.J.*
—	Pride of Moray ..	..	J. Archibald ..	Tasmanian Exam.	9.10.12	..
2700	*Pride of the South* ..	*5 years*	*J. Kent* ..	*Warracknabeal* ..	*7.8.14*	*G.H.*
2790	Prince	5 years	A. McDonald ..	Romsey	30.9.14	R.J.T.
2651	Prince Everet ..	5 years	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
2690	Prince Herd ..	5 years	J. Colvin ..	Tungamah ..	3.8.14	R.G.
2652	Radical	5 years	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
2736	Repeater	5 years	E. A. Rethus ..	Nhill	19.8.14	G.H.
2688	Ruby's Pride ..	5 years	W. G. Burns ..	Goroke	29.7.14	R.N.J.
2698	Royal Bob ..	5 years	T. Harcoan ..	Minyip	6.8.14	G.H.
2708	Royal Churchill ..	5 years	H. Wright ..	Shepparton ..	13.8.14	R.G.
2744	Royal Escort ..	5 years	Capt. J. A. Stewart-Balmain	Agricultural Offices	29.8.14	R.J.T.
2748	Royal Gartley ..	5 years	S. Knight ..	Terang	24.8.14	R.G.
2733	Royal Main ..	5 years	Stock Bros. ..	Casterton ..	*19.8.14*	R.G.
2798	Royal Salute ..	5 years	*J. T. Opie* ..	Newmarket Special	*19.10.14*	*R.G.*
2789	Royal Standard ..	5 years	H. S. Graham ..	Cobram Special ..	2.10.14	R.G.
2701	Royal Stewart ..	5 years	Dean Bros. ..	Euroa	12.8.14	N.McD.
2692	Runnymede ..	5 years	F. W. Grigg ..	Myrtleford ..	5.8.14	R.G.
2674	Shopnoller Ploughman	5 years	E. M. Walter ..	Royal Show Grounds	20.7.14	R.N.J.
2703	Statesman ..	5 years	J. Crane ..	Nathalia Special ..	12.8.14	R.G.
2661	Stewart's *Pride* ..	*5 years*	*J. Bourke* ..	*City Horse Bazaar*	*14.7.14*	*R.N.J.*
2653	Supremacy ..	5 years	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
2784	Sir Isaac	6 years	McCann Bros. ..	Royal Show Grounds	21.9.14	R.J.T.
2714	Sir Wilfred ..	5 years	A. J. Mackay ..	St. Arnaud ..	5.8.14	R.N.J.
2694	Taieri Chief ..	5 years	J. Buckley ..	Rutherglen ..	6.8.14	R.G.
2639	*Tibberton Dray King*	7 years	T. Withers and Sons	Wodonga Special ..	26.6.14	R.N.J.
2709	Titiroa Baron ..	5 years	Herkes Bros. ..	Pyramid ..	10.8.14	R.N.J.
2772	The Knight ..	5 years	E. R. Morton ..	Warragul ..	4.9.14	R.N.J.
2642	The MacPherson ..	5 years	Mitchell and O'Brien	Horsham ..	30.6.14	R.N.J.
2676	The Premier ..	5 years	Symon Bros. ..	Bendigo ..	23.7.14	R.N.J.
2662	The Stewart ..	5 years	A. Colvin ..	City Horse Bazaar	13.7.14	R.N.J.
2750	Umberslade Senator	5 years	R. A. Smales ..	Mildura ..	25.8.14	R.N.J.
2754	*Wee MacGregor* ..	5 years	Wm. Mattrass ..	Ouyen	26.8.14	R.N.J.
2770	Wigtonshire ..	5 years	Burton Bros. ..	Sale	3.9.14	R.G.
2773	Young Clyde ..	5 years	J. Harkins ..	Bacchus Marsh ..	10.9.14	R.J.T.
2743	Young Crown ..	5 years	Wyatt Bros. ..	Rainbow ..	25.8.14	R.J.T.
2675	Young Seddon ..	6 years	Holmes and Boadle	Royal Show Grounds	20.7.14	R.N.J.
			THOROUGHBREDS.			
2720	All Green	6 years	R. W. Storey ..	Euroa	12.8.14	N.McD.
2635	Braw Scot ..	Aged	D. Ryan ..	Newmarket Special	15.5.14	G.H.
2634	Count Traquair ..	5 years	D. Ryan ..	Caulfield Special ..	11.5.14	R.G.
2777	Galverston ..	6 years	*W. Barry* ..	Yarram ..	10.9.14	R.N.J.
2780	Gunplay	Aged	P. A. Harrington ..	Kilmore ..	17.9.14	R.N.J.
2721	Maltfield	6 years	R. W. Storey ..	Euroa	12.8.14	N.McD.
—	*Orfano*	Aged	J. Williams ..	New South Wales *Exam.*	15.9.11	..
2638	Portable	Aged	E. H. Waller ..	Balaclava Special	25.6.14	R.G.
—	Swirl	Aged	B. M. Burns ..	South Australian Exam.	27.10.10	..

Supplementary List of Life Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			LIGHT HORSES.			
2799	Almont B. ..	5 years	D. H. Hutchison	Yan Yean Special	11.12.14	R.G.
2767	Almont M. ..	Aged	J. Minns ..	Melton	5.9.14	R.J.T.
2781	Azraak	6 years	B. Folliot-Sandford	Royal Show Grounds	19.9.14	R.J.T.
2763	Cashier	Aged	A. W. Acocks ..	South Australian Exam.	14.9.14	..
2640	Commonwealth ..	5 years	S. Matheson ..	Horsham ..	30.6.14	R.N.J.
2798	Dustwood ..	5 years	C. L. R. McLure ..	Agricultural Offices	7.11.14	R.J.T.
2726	*Gentleman George* ..	*5 years*	*A. T. Jones* ..	*Geelong* ..	*13.8.14*	*N.McD.*
2713	Harkaway ..	5 years	H. O'Connor ..	Heathcote ..	4.8.14	R.N.J.
2656	Highland Cleve ..	6 years	T. Larcombe ..	City Horse Bazaar	13.7.14	R.G.
2695	Honest Cleve ..	5 years	O. Vince ..	Minyip	6.8.14	G.H.
2704	Juggler II. ..	Aged	G. J. Crisp ..	Agricultural Offices	15.8.14	R.G.
2768	*Kemp Daly* ..	*Aged*	*G. H. Minns* ..	*Melton*	*5.9.14*	*R.J.T.*
2787	Leeway	Aged	R. Carmichael ..	Portarlington Special	22.9.14	R.G.
2699	Lord Bingen ..	6 years	J. Pilkington ..	Warracknabeal ..	7.8.14	G.H.
2727	Marshal Wilks ..	5 years	E. McAteer ..	Geelong ..	13.8.14	N.McD.
2757	*Oakwood King* ..	*6 years*	*G. Woolterton* ..	*Maryborough* ..	*27.8.14*	*R.N.J.*
2761	Prince Kirk ..	Aged	T. Carmody ..	Warrnambool ..	27.8.14	R.G.
2760	Sam J.	5 years	N. Jones ..	Werribee	29.8.14	R.G.
2766	Sharpshooter ..	Aged	J. J. and W. Wheeler	Corryong ..	2.9.14	R.J.T.
2729	*Titanic*	*5 years*	*Wm. Day* ..	*Geelong* ..	*13.8.14*	*N.McD.*
2746	Walter Bell Boy ..	6 years	C. Ridley ..	Agricultural Offices	22.8.14	R.N.J.
2680	Welcome Lock ..	5 years	D. Cantini ..	Bendigo ..	23.7.14	R.N.J.
2654	Werocita	Aged	H. Ridett ..	Agricultural Offices	11.7.14	R.G.
2683	Whyami	5 years	R. R. Edyvean ..	Charlton ..	29.7.14	R.G.
2681	*Yarraberb McKinney*	*6 years*	*R. J. Wright* ..	*Bendigo* ..	*23.7.14*	*R.N.J.*
2734	Young Clarionet ..	5 years	J. Mitchell ..	Rochester ..	18.8.14	R.N.J.
2691	Young Majestic ..	5 years	J. Moroney ..	Yarrawonga ..	4.8.14	R.G.
2738	Young Swivel ..	Aged	E. Guppy ..	Benalla ..	20.8.14	R.N.J.
			PONIES.			
2664	*Astrologer*	*6 years*	*L. W. Clark* ..	*Royal Show Grounds*	*20.7.14*	*R.N.J.*
2762	Brigham III. ..	6 years	D. McKenzie ..	Colac	28.8.14	R.G.
2769	Captain	Aged	W. Kirkham ..	Dandenong ..	2.9.14	R.N.J.
2771	Chamberlain ..	Aged	A. L. Hardie ..	Warragul ..	4.9.14	R.N.J.
2774	*Claymore*	*5 years*	*J. P. Hanrahan* ..	*Ballan*	*11.9.14*	*R.J.T.*
2666	Concussion ..	5 years	W. R. Smith ..	Royal Show Grounds	20.7.14	R.N.J.
2675	Dandy Lad ..	5 years	Stuckey Bros. ..	Traralgon ..	1.9.14	R.G.
2778	Every Time ..	5 years	R. Crozier ..	Mernda ..	7.9.14	R.G.
2759	*Halcyon*	*6 years*	*Mrs. McLellan* ..	*Windsor Special* ..	*29.8.14*	*R.N.J.*
2725	Haloo Ragtime ..	5 years	O. A. Millard ..	New South Wales Exam.	6.4.14	.
2682	Harry Lauder ..	5 years	W. E. Rosling ..	Agricultural Offices	25.7.14	R.N.J.
2697	Honesty	6 years	Quinlan and McLean	Minyip	6.8.14	G.H.
2741	Ironbark	5 years	J. Price ..	Portland ..	20.8.14	R.G.
2645	Kelpie	5 years	P. Williams ..	Agricultural Offices	4.7.14	R.N.J.
2685	King Bee	5 years	W. T. McAlpine ..	Hopetoun ..	31.7.13	G.H.
2782	Leo Prince ..	5 years	M. Nathan ..	Royal Show Grounds	19.9.14	R.N.J.
2756	Little Jim ..	5 years	C. Broadfoot ..	Maryborough ..	27.8.14	R.N.J.
—	Merriment ..	5 years	H. Thompson ..	New South Wales Exam.	..	..
2728	Moorabool Lad ..	Aged	J. S. Thompson ..	Geelong	13.8.14	N.McD.
2742	Polo King ..	6 years	J. E. Ryan ..	Portland ..	20.8.14	R.G.
2693	Punter	Aged	J. Hiskins ..	Rutherglen ..	6.8.14	R.G.
—	Rifle Boy	..	P. R. Cooke ..	New South Wales Examination	11.5.14	..
2732	Scottie	5 years	J. Rochford ..	Hamilton ..	18.8.14	R.G.
2755	Shanter	6 years	Wm. Rogers ..	Warrnambool ..	27.8.14	R.G.
2752	Silverton	5 years	D. McDonald ..	Camperdown ..	26.8.14	R.G.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			PONIES—*continued.*			
2718	Tammas	Aged	J. Philip ..	Balmoral ..	13.8.14	G.H.
2749	Tankard	Aged	K. McKay ..	Penshurst ..	25.8.14	R.G.
2644	Tiger	6 years	S. H Bleakley ..	Horsham ..	1.7.14	R.N.J.
2717	*Tipperary* ..	*6 years*	*F. C. Smith* ..	*Goroke*	*29.7.14*	*R.N.J.*
2711	Warrack	5 years	Discaciati and Warburton	Swan Hill ..	12.8.14	R.N.J.
2793	Wee Laddie ..	5 years	R. Perry ..	Orbost	6.10.14	R.G.
2785	Welshman ..	5 years	W. H. Sowden ..	Royal Show Grounds	21.9.14	R.J.T.
2786	What Ho	5 years	C. Jones ..	Royal Show Grounds	21.9.14	R.J.T.
2788	Wonder II. ..	Aged	F. McDonald ..	Alexandra ..	27.8.14	R.J.T.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

(*Four-year-old Certificates expiring 30th June, 1915.*)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS.			
920/4	*Abbotsford Major* ..	J. Mitchell ..	New Zealand Exam. ..	24.5.14	..
981/4	Advance	S. Smith	Warrnambool Special	27.8.14	R.G.
936/4	Albert Onward ..	T. Coldwell ..	Shepparton	13.8.14	R G.
933/4	Argyle	F. McRae ..	Warracknabeal ..	7.8.14	G.H.
957/4	Baron	N. McDonald ..	Casterton	19.8.14	R.G.
992/4	Baron Hope	G. and W. Lord ..	Sale	3.9.14	R.G.
909/4	*Baron's Heir*	*G. Fraser*	*New South Wales Exam.*	*3.4.14*	..
891/4	Baron's Own	F. M. Clement ..	Balmattum Special ..	3.7.14	R G.
921/4	Baron Traill	E. Greeves ..	New Zealand Exam. ..	29.5.14	..
919/4	Bayswater	E. M. Walter ..	New Zealand Exam. ..	26.6.14	..
977/4	Blossom's Pride ..	J. Grant	Mildura	25.8.14	R.N.J.
889/4	*Border Prince* ..	D. S. Maddern ..	Horsham	1.7.14	R.G.
895/4	Cellus	Mitchell and O'Brien	City Horse Bazaar ..	*10.7.14*	*R.N.J*
898/4	Clan Campbell ..	W. A. Hammill ..	City Horse Bazaar ..	13.7.14	R.G.
991/4	Cock Robin	A. J. Redenbach ..	Bairnsdale	2.9.14	R.G.
974/4	Commander Yet ..	W. A. Creighton ..	Alexandra	27.8.14	R.J.T.
939/4	Convincer	Dyke Bros. ..	St. Arnaud	5.8.14	R.N.J
951/4	*Donald Stewart* ..	Maddern Bros. ..	Geelong	13.8.14	N.McD.
995/4	*Drummond* King ..	E. Greaves ..	Berwick	3.9.14	R.N.J.
967/4	Drum Style	R. Stewart ..	Kyabram	20.8.14	R.N.J
880/4	Drumslie	J. R. McKenzie ..	Glenroy Special ..	11.6.14	R.G.
896/4	Everlasting	W. Abram ..	City Horse Bazaar ..	10.7.14	R.N.J
960/4	Federal Tax	J. McMurray ..	Rochester	18.8.14	R.N.J.
904/4	*Gallant Newton* ..	F. W. Lewis ..	City Horse Bazaar ..	13.7.14	R.N.J.
883/4	Gay Garthland ..	J. W. McKenzie ..	Glenroy Special ..	11.6.14	R.G.
918/4	*General Buller* ..	*E. M. Walter* ..	New Zealand Exam. ..	26.6.14	..
979/4	Grampian Star ..	D. McDonald ..	Camperdown ..	26.8.14	R.G.
922/4	Gypsy Hero	W. J. Brewer ..	New Zealand Exam. ..	24.5.14	..
941/4	Hamilton's Pride ..	King Bros. ..	Birchip	8.8.14	R.N.J.
965/4	Hawthorn	Feery Bros. ..	Dimboola	20.8.14	G.H.
887/4	Heather Loch ..	R. Tucker ..	*Horsham*	30.6.14	R.N.J.
949/4	Khartoum	T. Wignell ..	Euroa	12.8.14	N.McD.

List of Terminable Certificated Stallions—*continued*.

Draughts—*continued*.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
928/4	Kilmarnock	Orton Bros.	Myrtleford	5.8.14	R.G.
906/4	*King Billy*	*H. Younger*	*City Horse Bazaar*	13.7.14	R.N.J.
885/4	King of the Kings	O. Muroske	Horsham	30.6.14	R.G.
929/4	King of the Valley	C. B. Woodyard	Wangaratta	7.8.13	R.G.
966/4	Lanark Again	W. J. Moll	Dimboola	20.8.14	G.H.
913/4	Land Lord	W. T. Loten	Royal Show Grounds	20.7.14	R.N.J.
968/4	Livingstone	E. and A. Breen	Kyabram	20.8.14	R.N.J.
953/4	Locksley	G. Noske and Sons	Hamilton	18.8.14	R.G.
1009/4	*Lord Bindi*	*R. T. Yapp*	*Omeo*	7.10.14	R.J.T.
890/4	Lord Cashier	A. and J. H. Young	Horsham	30.6.14	R.N.J.
1004/4	Lord Dunwell	J. P. Slattery	Ballarat Special	11.9.14	R.G.
902/4	*Lord Gordon*	*Mitchell and O'Brien*	*City Horse Bazaar*	10.7.14	R.G.
924/4	Lord Liverpool	W. T. Loton	New Zealand Exam.	24.5.14	..
907/4	Lord Melbourne	J. McLeod	City Horse Bazaar	13.7.14	R.N.J.
917/4	McCormack's Fancy	E. M. Walter	New Zealand Exam.	26.6.14	..
897/4	Main's Fancy	G. Allardice	City Horse Bazaar	10.7.14	R.G.
962/4	Major Lawrence	Berryman Bros.	Echuca	19.8.14	R.N.J.
993/4	Model Prince	P. E. Mathers	Sale	3.9.14	R.G.
930/4	*Modest King*	*B. Jones*	*Wangaratta*	7.8.14	R.G.
971/4	Newfield's Baron	J. Duxson	Stawell	24.8.14	R.J.T.
881/4	Newton Stewart	J. R. McKenzie	Glenroy Special	11.6.14	R.G.
963/4	*Noble Knight*	*R. Barron*	*Tatura*	20.8.14	R.N.J.
1007/4	Patriarch's Pride	M. J. O'Brien	Cobram Special	.10.14	R.G.
996/4	Paymaster	W. P. Maguire	Bunyip	4.9.14	R.G.
954/4	Premier Again	H. Jeitz	Hamilton	18.8.14	R.G.
899/4	Premier Glenorchy	M. J. Caffrey	City Horse Bazaar	13.7.14	R.G.
900/4	Premier Jack	G. Oxley, junr.	City Horse Bazaar	13.7.14	R.G.
925/4	Pride of Marong	H. C. Thomas	Bendigo	23.7.14	R.N.J.
988/4	*Pride of Scotland*	*A. Bright*	*Leongatha*	1.9.14	R.N.J.
908/4	Prince Albert	D. Keady	City Horse Bazaar	14.7.14	R.N.J.
998/4	Prince Aldie	Brock Bros.	Trafalgar	5.9.14	R.N.J.
931/4	Prince Edward	D. King and Sons	Rutherglen	6.8.14	R.G.
964/4	Prince Imperial	Minchin Bros.	Tatura	20.8.14	R.N.J.
999/4	Prince of Millfield	A. R. Lister	Ballan	10.9.14	R.J.T.
935/4	Prince of Nullan	J. Annison	Warracknabeal	7.8.14	G.H.
1006/4	Prince Royal	E. S. Wright	Royal Show Grounds	21.9.14	R.N.J.
978/4	Rhode's Champion	M. J. Caffrey	Mildura	25.8.14	R.N.J.
984/4	Rob Roy	G. Butler	Maryborough	27.8.14	R.N.J.
986/4	*Royal Arthur*	*Gilmore Bros.*	*Colac*	28.8.14	R.G.
882/4	Royal Connection	J. R. Mackenzie	Glenroy Special	11.6.14	R.G.
994/4	Royal Navy	J. McIlwain	Sale	3.9.14	R.G.
943/4	Royal Ribbon	G. Pearse	Swan Hill	12.8.14	R.N.J.
987/4	Scotland's Bloom	J. Wylie	Colac	28.8.14	R.G.
1010/4	Scottish Head	F. J. Erhardt	Beulah	13.10.14	R.G.
961/4	Scotty Chief	A. Rintoul	Nhill	19.8.14	G.H.
990/4	Shanter	O. Syme	Gisborne Special	7.9.14	R.J.T.
1002/4	Souter Jock	P. Le Roux	Lang Lang	11.9.14	R.N.J.
972/4	Stockman	C. H. Perkins	Rainbow	25.8.14	R.J.T.
969/4	*Sir Baron*	*C. J. Nuske*	*Jeparit*	21.8.14	G.H.
914/4	Sir Hector	T. Wallbridge	Royal Show Grounds	20.7.14	R.N.J.
901/4	Sir Lawrence	E. W. Fowler	City Horse Bazaar	13.7.14	R.G.
937/4	Sir Mac	A. J. Donaldson	Rushworth	14.8.14	R.G.
970/4	Topgallant	F. L. McIntosh	Jeparit	21.8.14	G.H.
973/4	The Crown	S. Atwell	Rainbow	25.8.14	R.J.T.
955/4	The Leader	T. H. Laidlaw	Hamilton	18.8.14	R.G.
923/4	The Shepherd	W. J. Brewer	New Zealand Exam.	24.5.14	..
903/4	Waipa	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
947/4	Young Herod	A. R. Douglas	Kerang	13.8.14	R.N.J.
959/4	*Young True Blue*	*B. J. Arthur*	*Kaniva*	18.8.14	G.H.

Thoroughbred.

1005/4	Malbrook	J. Widdis	Royal Show Grounds	21.9.14	R.J.T.

Light Horses.

952/4	*Aristocrat*	*H. Jeitz*	*Hamilton*	18.8.14	R.G.
985/4	Barwon Wilkes	Wm. Corlu	Colac	28.8.14	R.G.
938/4	Billie Wilks	G. A. Crozier	Shepparton	13.8.14	R.G.
932/4	Captain J.	J. S. Tait	Warrnambool	27.8.14	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		LIGHT HORSES—*continued.*			
1003/4	Conceit	W. H. Carpenter	Yarram	10.9.14	R.N.J.
905/4	Dandy Star	Mrs. J. Brown	City Horse Bazaar	13.7.14	R.N.J
915/4	Derby Chimes	H. Saunders	Wodonga Special	23.7.14	R.G.
976/4	Emulator's Pride	W. MacArthur	Terang	24.8.14	R.G.
960/4	Harvest Again	W. Wilson	St. Arnaud	5.8.14	R.N.J.
997/4	Honest Wilks	F. English	Warragul	4.9.14	R.N.J.
944/4	Hymeneus	W. McMeckin	Kerang	13.8.14	R.N.J
945/4	J. W. Whips	J. Scott	Kerang	13.8.14	R N.J
916/4	Marvin Wilkes	H. Saunders	Wodonga Special	23.7.14	R.G.
942/4	Match It	R. J. Wakeman and Sons	Pyramid	10.8.14	R.N.J.
888/4	Obligation	J. McClounan	Horsham	30.6.14	R.N.J.
980/4	*Osterley R.*	*D. Rowe*	Camperdown	26.8.14	R.G.
946/4	Ribbonlead	R. Smith	Kerang	13.8.14	R N.J
950/4	Siam	R. Hunter	Elmore	14.8.14	R.N.J
893/4	What's Wanted	L. M. Reynoldson, junr.	Numurkah	8.7.14	R.N.J.
894	Zolock O	D. McLeod	Numurkah	8.7.14	R.N.J
		PONIES.			
927/4	Dandy Hero	E. Brock	Sea Lake	30.7.14	R G.
1008/4	Dandy Nut	E. E. Small	Agricultural Offices	3.10.14	R.J.T.
958/4	Gibbie	W. Sanders	Kaniva	18.8.14	G.H.
975/4	*Grainmyr*	*E. Whiting*	*Alexandra*	27.8.14	R.J.T
912/4	King Tony	J. Kendall	Royal Show Grounds	20.7.14	R.N.J.
948/4	Kiwi	J. Moran	Balmoral	13.8.14	G.H.
884/4	Leo	J. Brown	Agricultural Offices	27.6.14	G.H.
1001/4	Little Willie Wilks	W. E. Gibson	Mirboo North	31.8.14	R.G.
934/4	Mountain Palm	F. W. Schickerling	Warracknabeal	7.8.14	G.H.
..	Roman Fireaway	H. Osman	South Australian Exam	28.10.14	..
989/4	Silverlight	R. T. Jarvis	Corryong	2.9.14	R.J.T
1000/4	Stylish Lad	E. J. Watson	Ballan	11.9.14	R.J.T.
956/4	The Baron	H. B. Jackson	Casterton	19.8.14	R.G.
926/4	Welshman	W. E. Rosling	Agricultural Offices	25.7.14	R.N.J.
983/4	Young Bracey	*D. W. Battarbee*	*Warrnambool*	27.8.14	R.G.

(Three-year-old Certificates expiring 30th June, 1915.)

DRAUGHTS.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1449/3	Abbot McArthur	J. Grant	New Zealand Exam.	22.6.14	..
1511/3	Abbotsford Chief	J. R. Henry	New Zealand Exam.	24.5.14	..
1509/3	Abbotsford Colonel	J. R. Henry	New Zealand Exam.	24.5.14	..
1448/3	Abbot's Pride	J. Grant	*New Zealand Exam.*	22.6.14	..
1527/3	Advance	R. Heywood	Kerang	13.8.14	R.N.J.
1436/3	Arawa	J. R. McKenzie	Glenroy Special	11.6.14	R.G.
1483/3	Australian Officer	G. Oxley, junr.	City Horse Bazaar	13.7.14	R.G.
1506/3	Balmoral Chief	R. *Geddes*	New Zealand Exam.	29.5.14	..
1475/3	Baron Abbot	J. McNamara, senr.	City Horse Bazaar	10.7.14	R.N.J.
1503/3	Baron Allison	G. Stokes	New Zealand Exam.	29.5.14	..
1477/3	Baron Kilbryde	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.N.J.
1447/3	Baron *Linwood*	Phillips Bros.	New Zealand Exam.	22.6.14	..
1487/3	Baron Milford	A. C. Petrass	City Horse Bazaar	13.7.14	R.N.J.
1488/3	Baron Northcote	R. H. Grant	City Horse Bazaar	13.7.14	R.N.J.
1450/3	Baron Samson	J. Grant	New Zealand Exam.	22.6.14	..
1533/3	Baron Twist	E. and C. Ham	Rochester	18.8.14	R.N.J.
1525/3	Ben Bolt	R. Winterbottom	Pyramid	10.8.14	R.N.J.
1493/3	Binder	*Sullivan Bros.*	Royal Show Grounds	20.7.14	R.N.J.
1514/3	Blairgowrie II.	J. Mitchell	New Zealand Exam.	26.6.14	..
1494/3	Bold Boy	J. Patrick	Royal Show Grounds	20.7.14	R.N.J.
1559/3	Braemore	*A. S. Chirnside*	Royal Show Grounds	25.9.14	R.J.T.
1476/3	Bright Boy	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
1542/3	Carlisle	M. Kennedy	Warrnambool	27.8.14	R.G.
1456/3	Castle Brae	W. J. Fraser	Horsham	30.6.14	R.G.
1512/3	Clan McGregor	*Dookie Agricultural College*	New Zealand Exam.	13.4.14	..
1555/3	Clear Light	Mitchell and O'Brien	Royal Show Grounds	21.9.14	R.G.
1457/3	Clermont	O. Maroske	Horsham	30.6.14	R.N.J.
1522/3	Clydesdale Prince	P. J. Connellan	Watchem	7.8.14	R.N.J.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS—continued.			
1484/3	Colonel Young	H. W. O'Brien	City Horse Bazaar	13.7.14	R.G.
1489/3	Conquering Hero	H. T. Whitty	City Horse Bazaar	13.7.14	R.N.J.
1495/3	Dapper	J. Crane	*Royal Show Grounds*	20.7.14	R.N.J.
1549/3	Darnley	W. Gooding	Trafalgar	5.9.14	R.N.J.
1496/3	Dazzle	J. Crane	Royal Show Grounds	20.7.14	R.N.J.
1535/3	Duke of Dahlen	A. C. Jorgensen	Dimboola	20.8.14	G.B.
1534/3	Dunvegan	L. McLeod	Tatura	20.8.14	R.N.J.
1518/3	Eastern Star	D. and G. McDonald	Minyip	6.8.14	G.H.
1497/3	Edinbro'	J. H. Hall	Royal Show Grounds	20.7.14	R.N.J.
1458/3	Elberfeld	O. Maroske	Horsham	30.6.14	R.G.
1472/3	Federal Duke	E. Williamson	Numurkah	8.7.14	R.N.J.
1459/3	Federal Knight	J. H. Hall	Horsham	30.6.14	R.N.J.
1454/3	Federal Sandy	T. Leavey	Cobram	11.8.14	R.G.
1529/3	Federal's Fancy	A. Hale	Geelong	13.8.14	N.McD.
1478/3	Fieldmont Grand	E. Ruddock	City Horse Bazaar	10.7.14	R.N.J.
1523/3	Forest King	J. Walder and Sons	Watchem	7.8.14	R.N.J.
1468/3	Frog Puddles	T. Lawson	Horsham	1.7.14	R.N.J.
1460/3	*Hampton Style*	*B. A. Staughton*	Horsham	30.6.14	R.G.
1490/3	Harkstead Laddie	C. R. Roper	City Horse Bazaar	14.7.14	R.N.J.
1519/3	Herdsman	H. Daniels	Warracknabeal	7.8.14	G.H.
1531/3	Imperial Newton	E. H. Nolte	Hamilton	18.8.14	R.G.
1453/3	*Invermay*	*A. Colvin*	Nathalia	12.8.14	R.G.
1498/3	Johnnie Walker	K. C. Harper	Royal Show Grounds	20.7.14	R.N.J.
1507/3	Keith Hall	E. M. Walter	New Zealand Exam.	24.5.14	..
1479/3	King of the Moas	G. Allardice	City Horse Bazaar	10.7.14	R.G.
1461/3	*Loraine*	*O. Maroske*	*Horsham*	30.6.14	R.N.J.
1452/3	Lyndale	A. McKinnon	Charlton	29.7.14	R.G.
1462/3	Lord Clivedon	T. E. Parry	Horsham	30.6.14	R.N.J.
1480/3	Lord Everest	Mitchell and O'Brien	City Horse Bazaar	10.7.14	R.G.
1554/3	*Lord Fairbairn*	*A. B. Anderson*	*Korumburra*	9.9.14	R.N.J.
1516/3	Lord Liverpool	J. R. Henry	New Zealand Exam.	22.6.14	..
1465/3	Master Jack	W. T. Bodey	Horsham	30.6.14	R.N.J.
1446/3	Master Plunket	A. Chrystal	New Zealand Exam.	22.6.14	..
1515/3	Mosgiel Duke	E. M. Walter	New Zealand Exam.	29.5.14	..
1539/3	Navy Blue	R. Fish	Port Fairy	21.8.14	R.G.
1492/4	Newton Prince	H. C. Young	Agricultural Offices	18.7.14	G.H.
1470/3	Orbost Again	F. G. Allan	Horsham	1.7.14	R.N.J.
1463/3	Patriotic	G. Greenaway	Horsham	30.6.14	R.N.J.
1502/3	Plunket's Pride	J. Helding	New Zealand Exam.	22.6.14	..
1513/3	Premier's Fancy	J. Mitchell	New Zealand Exam.	26.6.14	..
1481/3	Premier Thomas	W. Macknight	City Horse Bazaar	10.7.14	R.N.J.
1485/3	Purple Heather	J. Stokes	City Horse Bazaar	13.7.14	R.G.
1508/3	*Ronaldson*	*G. Allardice*	*New Zealand Exam.*	*24.5.14*	..
1473/3	Royal Chief	H. Rolls	Numurkah	8.7.14	R.N.J.
1466/3	Royal Kin	W. T. Bodey	Horsham	30.6.14	R.N.J.
1471/3	Royal Salute	J. Bodey and Sons	Horsham	1.7.14	R.N.J.
1543/3	Royal Son	J. J. Gleeson	Warrnambool	27.8.14	R.G.
1542/3	Royal Winsome	J. P. Belleville	Watchem	7.8.14	R.N.J.
1474/3	*Saxon Prince*	*T. Wearne*	*Numurkah*	8.7.14	R.N.J.
1435/3	Scotch Hawk	O. E. Bodey	Sunbury Special	25.5.14	R.G.
1257/3	Scottie	Hansen Bros.	Numurkah	8.7.13	R.N.J.
1566/3	Scottie	A. Robertson	New Zealand Exam.	13.4.14	..
1544/3	*Scottish Chief*	*J. Galloway*	*Maryborough*	27.8.14	R.N.J.
1567/3	Scottish King	W. Lynch	Beaufort Special	8.3.15	R.G.
1482/3	Shepherd King	J. Erwin, senr.	City Horse Bazaar	10.7.14	R.N.J.
1504/3	Shepherd's Glory	J. R. Henry	New Zealand Exam.	29.5.14	..
1564/3	*Shepherd's Pride*	*F. Jende*	*Beulah Special*	*13.10.14*	R.G.
1510/3	Silver King	J. R. Henry	New Zealand Exam.	24.5.14	..
1464/3	Starlight	Mitchell and O'Brien	Horsham	30.6.14	R.N.J.
1499/3	Sir Peter	J. H. Hall	Royal Show Grounds	20.7.14	R.N.J.
1500/3	Sir Walter	J. R. Henry	Royal Show Grounds	20.7.14	R.N.J.
1526/3	Tam	J. T. Collins	Pyramid	10.8.14	R.N.J.
1455/3	Thorn Blend	J. Alexander	Shepparton	13.8.14	R.G.
1467/3	The Candidate	W. T. Bodey	Horsham	30.6.14	R.N.J.
1501/3	The Expert	F. Thonemann	Royal Show Grounds	20.7.14	R.N.J.
1486/3	The Fashion	Kennedy and Walters	City Horse Bazaar	13.7.14	R.G.
1469/3	The Squatter	Mitchell and O'Brien	Horsham	30.6.14	R.G.
1505/3	Urypark Shepherd	E. Greaves	New Zealand Exam.	29.5.14	..
1551/3	Woodstock	J. Graham	Ballan	11.9.14	R.J.T.
1517/3	Young Baron's Pride	J. McGrath	Yarrawonga	4.8.14	R.G.
1521/3	Young Lawrence	L. Forge	Shepparton	13.8.14	R.G.
[illegible]	Young McClelland	H. McKinley	Romsey	30.9.14	R.J.T.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	LIGHT HORSES.				
1451/3	Belmont Chimes	G. Greaves	Bendigo	23.7.14	R.N.J.
1552/3	*Blue Wilks*	*J. W. McNeill*	*Mirboo North*	31.8.14	R.G.
1537/3	Bonnie Palm	W. Pollock	Jeparit	21.8.14	G.H.
1538/3	Brigham Bell	J. Powell	Port Fairy	21.8.14	R.G.
1553/3	Corroboree King	F. B. Lithgow	Lilydale	7.9.14	R.N.J.
1556/3	Dandy Bells	G. H. Alford	Royal Show Grounds	19.9.14	R.J.T.
1520/3	Elect Wood	H. A. Fisher	Shepparton	13.8.14	R.G.
1557/3	Eltham	Wm. Benson	Royal Show Grounds	21.9.14	J.T.
1541/3	*Federal Chimes*	*D. Rowe*	*Camperdown*	26.8.14	R.G.
1532/3	Garney Direct	G. A. Maguire	Bendigo Special	18.8.14	R.N.J.
1563/3	King	Mrs. Schneider	Beulah Special	13.10.14	R.G.
1536/3	Lord Palm	C. Altmann	Dimboola	20.8.14	G.H.
1546/3	Marcus	N. Jones	Werribee	29.8.14	R.G.
1548/3	Scot's Spirit	H. S. Stansmore	Camperdown	26.8.14	R.G.
1550/3	Sunny Voyage	J. M. Roche	Trafalgar	5.9.14	R.N.J.
	PONIES.				
1547/3	Brigham IV.	J. McGrath	Colac	28.8.14	R.G.
1528/3	Dandy Lion	P. W. Carr	Geelong	13.8.14	N.McD.
1561/3	Dandy Wonder	P. W. Devlin	Geelong Special	29.9.14	R.G.
1545/3	Golden Locke	J. James	Colac	28.8.14	R.G.
1560/3	Happy Boy	W. J. Phalp	Geelong Special	29.9.14	R.G.
1540/3	Harry Lauder	E. R. Elford	Penshurst	25.8.14	R.G.
1565/3	Naughtier	E. Boulton	Agricultural Offices	17.10.14	R.J.T.
1558/3	Romance	Ingram Bros.	Royal Show Grounds	21.9.14	R.J.T.
1530/3	Royal George III.	Bell Bros.	Geelong	13.8.14	N. McD.
1491/3	Welsh Glyn	W. E. Craig	City Horse Bazaar	13.7.14	R.N.J.

(Two-year-old Certificates expiring 30th June, 1915.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	DRAUGHTS.				
235/2	Aristocrat	E. A. Dahlenburg	Horsham	30.6.14	R.N.J.
231/2	Champion	Jno. Annison	Horsham	30.6.14	R.G.
227/2	Hugo	W. H. Thomas	Horsham	30.6.14	R.G.
228/2	Ian Walton	F. W. Sallman	Horsham	30.6.14	R.G.
234/2	Loch Gowrie	W. T. Bodey	Horsham	30.6.14	R.N.J.
238/2	Newton Lad	E. Robinson	Warracknabeal	7.8.14	G.H.
232/2	*Royal Signal*	*F. C. Thomas*	*Horsham*	30.6.14	R.G.
237/2	Royal Sovereign	T. Thornton	Melbourne Special	1.8.14	R.G.
241/2	The Liberal	J. Graham	Ballan	11.9.14	R.J.T.
229/2	Waldermere	F. W. Sallman	Horsham	30.6.14	R.N.J.
240/2	Young Kelmscott	H. Thompson	Kaniva	18.8.14	G.H.
	LIGHT HORSES.				
239/2	Fleetfoot	P. Fisher	Jeparit	21.8.14	G.H.
233/2	Gratton Again	P. Greenaway	Horsham	30.6.14	R.N.J.
243/2	Merrimu	G. M. Vallence	Royal Show Grounds	19.9.14	R.J.T.
242/2	Muskaloon	C. Barlow	Yarram	10.9.14	R.N.J.
	PONY.				
236/2	Dandy Cland	E. W. Neck	Bendigo	28.7.14	R.N.J.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

(Continued from page 145).

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

The Black Box (*Eucalyptus bicolor*).

(Fig. 20.)

This is a dry-country eucalypt, it is found in the West and North-West of Victoria, between Swan Hill and Mildura, extending southward across the Adelaide-Melbourne railway line and to the western base of the Grampians, chiefly on the black soil of Mallee swamps. It is known by many different names, such as swamp box, dwarf-scrub, river or drooping box.

This tree may grow to a height of 120 feet, but in some situations little more than a large shrub. As a tree it is of a spreading and drooping habit with a general resemblance to yellow box. The ash-grey or blackish bark continues, however, on to the small branches. The wood is reddish, with very little sapwood, hard interlocked and very durable. It is to some extent used for fencing where straighter timber is absent.

The leaves are long narrow lance-shaped, not very thick, the veins fine, not close, the marginal vein at a distance from the edge of the leaf. The flowers are small, white, with sometimes pinkish or even crimson blossoms on the same tree, hence the botanical name "bicolor" (two-coloured). The umbels or clusters carry three to eight flowers in sprays at the end of branchlets; the buds are egg-shaped with rounded tops; the fruit is small cup-shaped, contracted at the top.

The black box blossoms in January and February, lasting about six weeks. Like yellow box, it blossoms every second year, the buds appear about eleven months before. The honey of this tree is of good quality, often very dense, but not so pale as that of yellow box; it is, however, doubtful whether it is ever obtained free from admixtures of honey from other sources. It yields pollen to bees, and is one of the best bee forage trees of the districts in which it grows.

The Blue Gum (*Eucalyptus globulus*).

(Fig. 21.)

The blue gum is one of the best-known eucalypts, extensively planted not alone in Australia, but also in America, North and South Africa, India, and Southern Europe. In a natural state it is found in valleys as well as on ridges and mountain slopes, chiefly in humid regions of the southern and eastern portions of Victoria, from the vicinity of Cape Otway to Wilson's Promontory, northward to the Murray and Tumut Rivers in the southern part of New South Wales, on the islands in Bass Straits, and in many other places, but particularly the southern parts of Tasmania.

The blue gum is a tall tree of upright growth attaining under favorable conditions a height of over 200 feet and a stem diameter of 10 feet. The timber is of a rather pale colour, hard, heavy, strong, and durable; it is more twisted than that of messmate and peppermint, but not so interlocked as that of red gum and of yellow and other box trees. In house building, it is one of the best timbers for joists, studs,

Fig. 20.—The Black Box (*Eucalyptus bicolor*, A. Cunn.)

rafters, &c. It is very extensively used by carriage-builders and manufacturers of implements, as well as for telegraph poles, jetty and bridge work.

The leaves are scattered on the robust four-edged branchlets, lance or lance-sickle shaped, thick, and of equal colour and somewhat shining on both sides; the veins of the leaves are moderately spreading and slightly

prominent, the marginal vein removed from the edge. The flower buds, which are warty, tinged with a bluish white bloom; they appear generally singly, less frequently two or three together at the shoulders of leaves. The lid of the bud is depressed hemispherically, and by its peculiar shape and warty appearance easily distinguishes the blue gum from all other Victorian eucalypts. The fruit is large and three to five rarely six, celled.

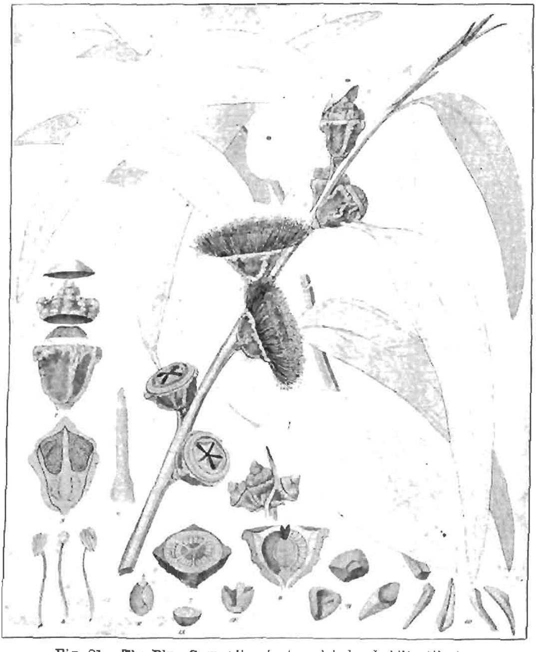


Fig. 21.—The Blue Gum (*Eucalyptus globulus Labillardière*).

The seedling plants and suckers are of a waxy powdery bluish whiteness, have sharply four-cornered stems, and opposite stalkless heart-shaped or oval heart-shaped leaves.

The blue gum usually blossoms during the winter months, and on this account does not rank high as a honey yielder, the colonies of bees

being at this time in a semi-dormant state; it is, however, worked on by bees for both nectar and pollen, but as no surplus honey can be stored during cold weather, little is known as to the character and flavour of the honey except that it is rather dark in colour.

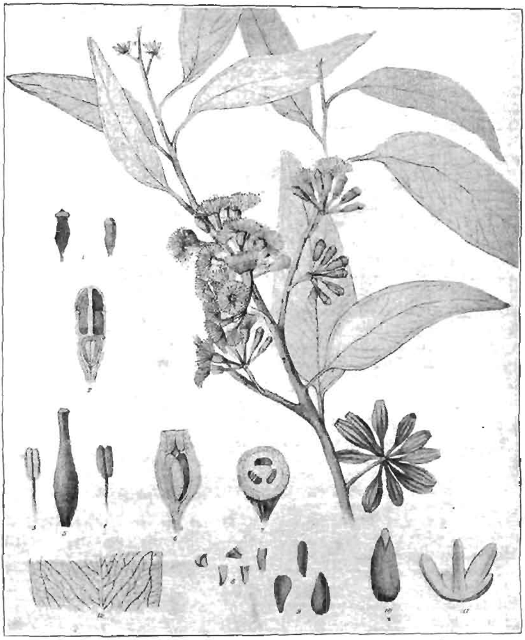


Fig. 22.—The Sugar Gum (*Eucalyptus cladocalyx syn. E. corynocalyx*).

THE SUGAR GUM (*Eucalyptus cladocalyx*). *Synonym E. corynocalyx.*

(Fig. 22.)

This tree is a native of South Australia, and the lower Wimmera, in Victoria. It reaches a height of 120 feet, the trunk attaining a final diameter of 5 or even 6 feet. The bark is smooth; the wood durable and used for fence posts, railway sleepers, and other purposes.

The leaves are scattered on the branchlets broad-lance or long-lance shaped, narrowing only very gradually towards the point; there is an oily lustre on both sides of the leaf, but the underside is somewhat paler. The veins are numerous, moderately spreading, the marginal vein removed from the edge of the leaf. The clusters of flowers are on *the side of the branchlets, or at the shoulders, but frequently below* the leaves on round stalks carrying from four to sixteen flowers. The buds are bell-shaped cylindric, with a blunt or slightly pointed lid; the fruit is urn-shaped, streaked lengthways, and three-celled.

The sugar gum is now extensively planted in parks and public gardens, being much more suitable for this purpose in dry warm localities than the blue gum, which under these conditions dies back after it has attained a certain age.

As a nectar-yielding tree the sugar gum is one of the best, its value as such has so far not been sufficiently appreciated by apiarists, because only in isolated instances is it found in sufficient numbers to produce that condition of the hives known as a honeyflow. The buds appear about thirteen months before the flowering period which occurs in January and February. It blossoms every year for a number of years and then misses one season. The blossom is very fragrant, secretes nectar freely, and lasts for a considerable time in comparison with many other eucalypts, attracting honey-eating birds, bees, and insects all day. The honey is of excellent flavour and aroma, of pale straw colour, and good density. As to pollen gathered by bees from this source the observations and opinions of apiarists differ, probably in consequence of local conditions, and so far no definite information as to the value of the sugar gum as a pollen-producer is available.

(To be continued.)

A NEW TYPE OF ARTIFICIAL FERTILIZER.

In a paper read before the Society of Arts of London by Prof. W. B. Bottomly, a new type of fertilizer was described, which threatens serious competition with the products of the electric furnace.

After giving an account of various previous attempts to utilize for fertilizing purposes the power of certain bacteria found on the roots of some plants to fix atmospheric nitrogen, and showing how these attempts had been successful, Prof. Bottomly described experimental work carried on at the botanical laboratory of King's College, claiming that it had been attended with complete success. It was found that suitably treated peat formed a most excellent medium for the growth of the bacterium, and soils manured with this peat have shown a marked enhancement of their fertility. Before inoculating the peat with the bacterium in question the raw peat has to undergo a preliminary treatment by another bacterium, which was found to have the power of converting natural peat into a humated neutral medium. Attempts to achieve the same end by neutralizing the humic acid of the peat by alkalies resulted in complete failure.

The peat, after inoculation with the special bacterium, is kept at constant temperature for a week or ten days, after which it is sterilized by the action of live steam.

It is then inoculated afresh with a mixture of *azotobacter chronococcum* and *bacillus radiacola*, and after a few days incubation at 26 deg. C. is ready for use. The following table shows the effect of the treatment as proved by analysis.

Analyses of a garden soil and other natural manures are also given for comparison.

Material Analysed.	Percentage Soluble Humate.	Percentage Soluble Nitrogen.	Percentage Total Nitrogen.
Raw peat	·028	·214	1·267
Bacterized peat	15·194	2·694	4·310
Garden soil	·012	·026	·427
Fresh soluble manure	·433	·291	2·533
Well-rotted stable manure ..	1·46	·439	2·848
One-year-old peat moss litter ..	1·05	·826	2·587

An important point is that the azotobacter continue to flourish after the peat has been added as manure to the soil to be fertilized, thus fixing further nitrogen.

In a series of comparative experiments made on an exhausted soil, the new manure showed the following percentage of advantages over its competitors:—

Crop.	Inoculated peat.	Artificials.	Farm Manure.
Potatoes	123	75	41
Turnips	100	47	26
Beet	281	54	43
Onions	110	110	46
Carrots	260	20	28

With fertile soils, the addition of a very little of the treated peat is stated to give a very large increase in the rate of growth. This is believed to be due to the presence in the peat of accessory food bodies, for which a special search is now being made.

—*The Journal of Industrial and Engineering Chemistry*, June, 1914.

CALCIUM CYANAMIDE.

Interesting data in connexion with calcium cyanamide, one of the new nitrogenous fertilizers, is given by E. J. Pranke, in the *Chemical News*, 17th July, 1914. The following are some extracts:—

"Perhaps the most important question that can be asked about cyanamide is: What is its fertilizing value? Does it give to the farmer year after year a consistent profit on his investment that compares favorably with the profit on an equal expenditure for some other material?

"One way to answer the question is to fertilize one-third of a field in the ordinary way with a properly compounded commercial cyanamide mixture, fertilize another one-third with some other standard mixture of equivalent analysis, and omit fertilizers from the remaining one-third.

"The answer given by such an experiment usually is that cyanamide may be profitably substituted for an equivalent amount of nitrogen in other standard forms.

"The farmer's use of fertilizers in general is guided solely by the profits derived therefrom. He is continually seeking to learn in what way and in what amounts he shall apply his fertilizers so as to derive a maximum profit The broad result of this general searching for the best ways is the formation of certain standards of fertilizer practice. These standards are in actual operation on the farms where the most money is being made."

The author summarizes as follows:—

(1) The cost of food products in the United States has increased about twice as fast as the cost of other commodities, and about twice as fast as the general cost of living throughout the world. This tendency can be offset by an increased crop production, which will lower the price of food products, and hence the cost of living. Fertilizers are the most important single factor in increasing the crop production.

(2) Nitrogen is the most expensive, and, agriculturally, most necessary element in commercial fertilizers. A general reduction in the cost of the latter must come through increased production of nitrogen at lower cost. The cyanamide process is probably the cheapest known source of fertilizer nitrogen.

(3) The rapid successful development of the economically important cyanamide industry has been full of difficulties, practically all of which have been overcome or minimized by paying attention to the quantitative factors involved.

(4) The greatest common error in the experimental testing of cyanamide has been in the use of excessive quantities. When used in normal agricultural quantities the results are entirely satisfactory.

(5) All difficulties from the farmer's stand-point are removed by the complete reaction of the cyanamide with acid phosphate in commercial mixtures. Such mixtures consume practically all of the American output of cyanamide.

(6) Cyanamide has several special advantages as an ingredient in mixed fertilizers.

In the manufacture of calcium cyanamide the nitrogen is obtained from the air by a process of distillation, after which it is caused to combine electrically with calcium carbide at a very high temperature. The approximate analysis would be—

Nitrogen—18 per cent.
Lime—50-60 per cent.

The fertilizer is known generally as nitrolim. Very little, if any, has been imported into Victoria. An agency exists in Melbourne, Sydney, Perth and Fremantle.

THE WALNUT.

(Continued from page 248.)

C. F. Cole, Orchard Supervisor.

HARVESTING—*continued.*

F. Peneveyre, in *Le Noyer et sa Culture*, writes as follows:—New mode of harvesting (knocking down) nuts. (Plate 29.)

Under this heading, M. Husard-Duplessis writes:—"We think it well to here make known a new method for harvesting nuts, invented

Fig. 29.—Harvesting Walnuts.

and proposed by M. Moutant, who describes it in these terms:—'The accompanying illustration shows the most usual form of tree when in full bearing. Towards the summit of the tree I fixed, by two rope bonds, a wooden pole about 16 feet long by 3 inches average thickness This pole, to the upper end of which a long rope is tied, may be compared to a long whip, temporarily fixed (by the handle) to the tree,

the lash of which can be worked up and down over the foliage by a man walking round the tree. The action of the rope knocks down the nuts from the branches, owing to the circular motion communicated to the rope by the operator, who is able to work safely and to see what he is doing.' " The pole and hook method of shaking down the nuts is the most practicable way in vogue at present in Victoria. Whichever method is adopted, the nuts should not be allowed to remain lying upon the ground for any length of time, as there is a risk of the shells becoming discoloured. The nuts should be gathered up and placed in sacks (corn) ready for washing, so as to remove any dirt, &c., adhering to the shell. The sooner they are washed after picking up, the easier they will be to clean.

WASHING.

Washing the nuts produced by any one grower in Victoria may be performed and carried out by using tubs or other suitable vessels But where large quantities have to be handled, other and more up-to-date methods should be adopted. Nuts that have been washed and have a clean attractive appearance are of greater market value than those having a stained and dirty appearance.

The following is an extract from Bulletin No. 231, United States Department of Agriculture, dealing with nut-washing upon a large scale, as practised in California:—"After being picked up and placed in sacks, the nuts are carried to some convenient point and washed, in order to remove dirt, portions of the husk, &c., which may be sticking to them. Such washing is done in large cylindrical drums made of coarse wire netting, in which the nuts are slowly revolved under a stream of water, grinding against each other and against the wires forming the sides of the drum. In this way all the nuts which have fallen normally from the husk, and those in which most of the husk has been removed by hand during picking, are very thoroughly cleaned. For removing the more tightly-attached husks of the sunburned nuts and 'stick-tights,' various devices are used, consisting in a general way of cylinders with sharp projections from the sides, by means of which a considerable proportion of these nuts are cleaned up fairly well. Those still having portion of the husk adhering to the shell are gone over again by hand, removing the husks which can be got off without too much effort—there always remains a greater or less proportion of these 'stick-tights,' which must be picked out and discarded."

DRYING.

"After washing and other cleaning operations are over, the nuts, in a dripping wet condition, are placed in large trays having bottoms composed of slats (strips of wood) spread about ½ inch apart, so that the nuts may drain. These trays are commonly about 6 x 3 feet by 6 inches deep, thus holding several layers of nuts. The side boards are allowed to project at the ends, and are shaped into handles for lifting the trays. In the trays the nuts are stirred, spread out in the open, or stacked up and covered, according to the weather, with the object of drying them as rapidly as possible without too great exposure either to the sun or to moisture. If over exposure to the sun, they

are liable to split open, especially the poorly-sealed varieties. If left too long in a moist condition, they may become mouldy and discoloured.

"The larger and more progressive walnut-growers in California use artificial heat and enclosed buildings for drying their walnuts, rather than depend upon the uncertainties of the weather. In this way the nuts can be dried uniformly and quickly, with no exposure to rain or hot sunshine."

BLEACHING.

The bleaching of the nuts after they have been washed and dried, so as to give the shells a bright light-coloured attractive appearance is widely adopted in California, but is not practised, to the writer's knowledge, in Victoria. Various methods are in vogue: the oldest method of exposing the nuts to sulphur fumes being discarded owing to the fumes penetrating the kernels and having a decided effect upon their flavour

Dipping the nuts into a solution of chloride of lime and sal soda to which sulphuric acid is added, causing the liberation of chlorine gas, which brings about the bleaching action, was generally adopted by walnut-growers in California. Formula:—6 lbs. of chloride of lime, 12 lbs. sal. soda, 50 gallons of water. Dissolve lime in about 4 gallons of water, stirring till dissolved. Dissolve the sal. soda in about 4 gallons of water. Add lime solution to soda solution, and stir well; let the carbonate of lime settle to the bottom, draw off the clear liquid, and add water to make a total of 50 gallons. Put the nuts in a large dipping box or lath crate, immerse in the fluid, and then add 1½ lbs. of 50 per cent. sulphuric acid, and agitate by raising and lowering the dipping box. The bleach should be reached in five to ten seconds, and the nuts are then washed in clear water and put out to dry. The same liquor can be used with new batches of nuts so long as the proper effect is produced, and small additions of acid will prolong the efficiency of the liquor.

Owing to litigation over the rights to use this process, which was covered by a patent, Professor Stabler, of the University of Southern California, Los Angeles, devised a new electric process, consisting essentially in passing an electric current through a 4 per cent. solution of common salt by means of electrodes immersed in the liquid. In this process chlorine is set free, and becomes available for bleaching, the nuts being immersed directly in the liquid through which the electric current passed. This electrical method of bleaching is still in process of development and improvement, and is considered by far the most satisfactory method yet devised. After passing through clear water and dried, the nuts are placed in the grader.

(*To be continued.*)

VINE PRUNINGS AS FODDER.

F. de Castella, Government Viticulturist.

The present disastrous scarcity of fodder gives a very real interest to any substance capable of being utilized as food for stock. In the canes removed when the vines are pruned in early winter we have a by-product of the viticultural industry which, though usually burnt off as rubbish, possesses, nevertheless, sufficient food value to be capable of saving from starvation, in a season like this, many thousand head of stock.

Some notes on vine prunings as fodder were contributed by the writer to this Journal in January, 1909,* quoting analyses which showed that silaged vine prunings did not compare unfavorably with meadow hay. Within the last seven years this rather novel fodder has been quite extensively used in France, especially in seasons of fodder shortage, being sometimes fed to stock after conversion into silage, but sometimes, also, direct from the shredder and crusher. In *Progres Agricole* of 19th June, 1910, the late J. Leenhardt-Pomier described how he used the freshly cut and crushed canes not alone, but mixed with other fodders, the cost working out at almost exactly 1s. 3d. per horse per day, on the following basis (the quantities mentioned are for eleven horses for one day):—

	Francs.	£	s.	d.
120 kilos. (264 lbs.) vine canes @ 0.50 fr. per 100 kilos. (4s. per ton) ..	0.60		..	
25 kilos. bran @ 16 fr. per 100 kilos. (£6 8s. per ton) .. .	4 0		..	
100 litres (22 galls.) water (costing 1d.)	0.10		..	
For 245 kilos. (539 lbs.)	4.70		..	
42 kilos. (92½ lbs.) oats @ 20 fr. per 100 kilos. (£8 per ton) ..	8.40		..	
27 kilos. (59½ lbs.) lucerne @ 9 fr. per 100 kilos. (£3 12s. per tons) ..	2.43		..	
Say ..	15.53	0	12	5
To this is added—				
Petrol for engine	0.50		..	
Wages (crusher and stable)	1.00		..	
	17.03	0	13	7½

"This diet, which is used for six months each year, has never presented any drawbacks; my horses kept in excellent condition during and after such feeding."

Several other articles (French) might be quoted, perusal of which makes one wonder that the totality of French vine prunings are not regularly used up as fodder. The explanation is to be found in their rather low digestibility, as is shown in an article by M. J. Fabre, lecturer at the Monpellier School, which appeared in *Le Progres Agricole* of 5th January, 1913. In this, after quoting several analyses, he gives the results of experiments carried out by him in the zoo-technical laboratory of the Montpellier School, in order to determine the coefficient of digestibility of this fodder.

* Information mainly derived from an article by M. Paul Béran in *Progrès Agricole* of Montpellier (France), 20th September, 1908.

M. Fabre deals mainly with silage made from canes and leaves, the vines being pruned before the latter have fallen. Such a course, *though not uncommon in bad years in France, is not to be recommended*, especially if the vines are pruned too early, since it interferes with the normal accumulation in the wood of the vine, of reserve substances assimilated by the leaves, a process which continues so long as they retain their green colour. The objection is the same as that against the early feeding off of the foliage, too often practised in our vineyards. *Once the leaves have changed colour, however, their removal* does not injure the vine. The following table shows that even as late as 15th November (15th May here), though they had lost some nitrogen, the other food substances had not varied much:—

Table A.

Percentage Composition of Fresh Vine Leaves (Aramon).

Date of Gathering.	Water.	Nitrogenous Matter.			Fats.	Nitrogen Free Extract.	Cellulose.	Mineral Substances.
		Total.	Proteid.	Non-Proteid.				
	%	%	%	%	%	%	%	%
1914—								
9th October ..	65·72	3·793	3·456	0·337	3·16	18·971	4·414	3·942
27th October ..	64·67	3·018	2·893	0·125	3·51	18·824	5·502	4·486
3rd November	66·63	2·737	2·550	0·187	3·89	16·326	4·739	3·896
15th November	67·66	2·200	..	..	4·20	17·445	5·168	4·327

"Vine leaves thus constitute a fodder which is rich in water and poor in protein. . . . It would require about 250 lbs. of fresh leaves to equal 100 lbs. of hay. . . . *According to Muntz, an acre of vines in Southern France yields from 2,250 to 8,100 lbs.* In our experiments the yield of fresh leaves was from 3,600 to 5,400 lbs. per acre." It is well to explain that the vines in the south of France are more closely planted than in Victoria—usually 5 feet by 5 feet.

Analyses of fresh vine prunings are given, as follows:—

Table B.

Percentage Composition of Fresh Vine Canes (Aramon).

Date of Removal.	Water.	Nitrogenous Matter.			Fats.	Nitrogen Free Extract.	Cellulose.	Mineral Substances.
		Total.	Proteid.	Non-Proteid.				
	%	%	%	%	%	%	%	%
1914—								
9th October ..	51·34	1·881	1·525	0·356	0·924	25·193	18·782	1·880
27th October ..	50·50	2·206	2·450	0·756	0·564	26·650	18·114	1·959
3rd November	50·13	2·418	1·640	0·778	0·780	24·825	19·845	1·994
15th November	54·86	1·925	..	..	0·722	21·521	18·804	2·186

"The canes contain less water than the leaves . . . but more cellulose . . . hence their digestibility must certainly be less. The date of removal does not seem to have appreciably influenced their composition." The yield per acre varied from 1,530 to 3,600 lbs. per acre.

Analyses of leaves and canes mixed, both before and after ensilage, are given, as follows:—

TABLE C.

PERCENTAGE OF COMPOSITION OF VINE PRUNINGS WITH LEAVES.

Nutritive Principles.		College Silage.		Mr. Richter's Silage.	
		Before Ensilage (27th October).	After Ensilage (16th November).	Before Ensilage (10th November).	After Ensilage (15th January).
		%	%	%	%
Dry Matter ..	..	39·691	44·750	40·689	42·200
Nitrogenous Substances	Total ..	2·612	3·125	2·249	2·648
	Proteid ..	2·372	2·862	1·890	2·191
	Non-proteid ..	0·240	0·263	0·359	0·457
Fat	.	5·158	5·862	2·398	2·852
Nitrogen Free Extract	..	17·990	19·940	21·949	19·906
Cellulose ..	..	7·481	8·502	10·020	11·925
Mineral Substances	..	6·450	7·321	4·073	4·869

Experiments to determine digestibility were conducted on a horse and on a sheep. The horse weighed 660 lbs., and was exclusively fed on vine silage (canes and leaves) from 8th January. After a preparatory period lasting until 15th January, a record was kept of the weight of food consumed daily, and samples of it were analyzed regularly. During the same period the solid excreta of the horse were likewise weighed and analyzed. These investigations continued from 15th to 20th January (inclusive); they rendered possible the calculation of the quantity of different substances digested and the determination of the coefficient of digestibility of the food in question. M. Fabre gives the result, as follows:—

CREDIT AND DEBIT BALANCE.

—	Dry matter.	Nitrogenous matter.	Fats.	Nitrogen free extract.	Cellulose.
Substances consumed ..	15·387	0·962	1·035	7·244	4·336
Substances recovered in fæces ..	9·454	0·761	0·824	3·091	3·323
Difference—substances digested	5·933	0·201	0·211	4·153	1·013
Co-efficient of digestibility (ratio of substances digested to substances consumed)	0·385	0·208	0·211	0·573	0·233

These coefficients are compared with those for straw and hay of medium quality, as follows (expressed in percentage):—

—	Vine silage.	Straw.	Hay.
Protein	20·8	19	57
Fat	21·1	21	24
Nitrogen free extract	57·3	32	55
Cellulose	23·3	27	36
Dry matter	38·5	30	48

"Thus, the protein of vine silage is not more digestible than that contained in straw. Likewise for fat and cellulose. On the other hand, the nitrogen free extract coefficient is as high as for hay. It may be added that the horse could not be kept on the above ration. It lost 22 lbs. in weight during the experiment."

With the sheep the results were very similar, the differences being trifling, except in the case of fat, the coefficient for which was 0.117, as compared with 0.211 in the experiment on the horse.

Vine silage seems to have proved more suitable to the sheep than to the horse, since the former "did not vary in weight, owing, it would seem, to its having eaten proportionately more of the fodder than the horse."

Applying the digestibility coefficient to the analyses of vine silage given above, M. Fabre finds that 100 kilos of this fodder would be equivalent in food value to 43 kilos of hay or 83 kilos of straw (wheaten). He concludes as follows:—"According to our experiments, the fodder value of vine silage (canes and leaves) is distinctly inferior to that of hay. It is scarcely equal, in fact, to that of straw. The data which precede will enable one to calculate the profit realizable from the use of vine canes as an animal ration. Any economy which may be effected will thus depend on the cost price of this fodder and the market value of other foods. Admitting, with M. Giret and other practical men, that the cost of 100 kilos of vine prunings is 3 francs (£1 4s. per ton), the conclusion is forced on one that their use will only become really profitable when straw and hay are very dear."

"In any case, it would not be advisable to feed exclusively with vine silage. A sufficient proportion of a concentrated food should necessarily be mixed with it."

That vine canes have a fodder value is evidenced by the fact, well known to most vineyard owners, that when vine prunings are thrown over the fence into an adjacent paddock, cattle eat them readily, even though there may be plenty of grass about. They show a marked preference for certain varieties, such as muscats, for example.

It is a pity that the digestibility of prunings without leaves was not also investigated, since it is the form which should interest us most here. After the dreadful ordeal their vines have been through, our growers are scarcely likely to run any risk of damage to the 1916 vintage by pruning before the fall of the leaf. M. Leenhardt's communication, referred to above, proves that winter prunings can be profitably used, at any rate in a mixed ration, even in normal times. In

the present emergency they are likely to prove of far greater value, and it is to be hoped that the many thousand tons of prunings which will shortly demand removal from the vines will be turned to useful account, instead of being burnt, as may prove more economical in seasons of plenty.

Unfortunately, the shredders and crushers specially designed for treating vine prunings in France are not obtainable here. Chaffing with an ordinary chaffcutter, followed by passage through a corn crusher, may, however, prove sufficient, especially if the chaffed and crushed canes are mixed with other fodder.

SHODDY AS A FERTILIZER.

The value of shoddy as a bulky organic manure is well known, and in view of the enormous quantity of wool that is being worked up in Yorkshire for army requirements, the supply of wool waste and shoddy during the next few months will be unusually large.

Generally speaking, the term "shoddy" is applied to any form of waste from silk or wool manufacturing which is no longer profitable to work up for cloth.

Mr. A. D. Hall, in his work on "Fertilizers and Manures," points out that pure wool contains over 17 per cent. of nitrogen, pure silk about as much, while shoddies composed of carpet waste, cloth clippings, and gun wad waste may contain as much as 14 per cent. of nitrogen.

Less valuable, because of the admixture of dirt, are wool combings, flock dust, and other cloth wastes where cotton is also used, which may contain 5 to 10 per cent. of nitrogen, while the manufacturing dust from textile factories, the sweepings of workshops, etc., may contain not more than 3 per cent.

That the value of shoddy as manure has long been known is shown by the following passage written by Blythe in the year 1653:—"Coarse wool, nippings, and tarry pitch marks, a little whereof will do an acre of land, *there is great virtue in them.* I believe one load hereof will exceedingly well manure half an acre."

At the present time shoddy is mainly used by the hop and fruit growers.—[*Fertilizers and Feeding Stuffs Press*, 16th January, 1915. Experiments conducted in the Laboratory of the Victorian Agricultural Department during 1912 show 50 per cent. (approximate) of the nitrogen in shoddy to be available in a month.]

FINAL RESULTS.

FOURTH VICTORIAN EGG-LAYING COMPETITION, 1914-1915.

Commenced 15th April, 1914 ; concluded 14th April, 1915.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition.			Position in Competition.
			15th April to 14th March.	15th Mar. to 14th April.	Final Total.	
		LIGHT BREEDS.				
		WET MASH.				
26	White Leghorns ..	Mrs. H. Stevenson ..	1,505	128	1,633	1
36	" ..	E. A. Lawson	1,541	52	1,593	2
25	" ..	J. H. Gill	1,533	54	1,587	3
10	" ..	R. Hay	1,430	97	1,527	4
16	" ..	A. R. Simon	1,415	106	1,521	5
9	" ..	J. J. West	1,418	84	1,502	6
17	" ..	F. *Doldissen*	1,394	92	1,486	7
40	" ..	J. Schwabb	1,372	106	1,478	8
11	" ..	C. J. Jackson	1,389	88	1,477	9
19	" ..	Maryville Poultry Farm ..	1,387	88	1,475	10
33	" ..	W. G. Osburne	1,372	82	1,454	11
8	" ..	F. W. Brine	1,296	117	1,413	12
45	" ..	H. C. Brock	1,342	55	1,397	13
37	" ..	S. Brown	1,346	49	1,395	14
29	" ..	V. Little	1,329	62	1,391	15
23	" ..	S. Buscumb	1,327	61	1,388	16
4	" ..	Giddy and Son	1,340	40	1,380	17
30	" ..	G. W. Robbins	1,279	98	1,377	18
20	" ..	A. W. Hall	1,287	78	1,365	19
22	" ..	B. Mitchell	1,279	84	1,363	} 20
47	" ..	W. G. Swift	1,274	89	1,363	}
15	" ..	E. Waldon	1,283	77	1,360	22
14	" ..	F. C. Western	1,243	82	1,325	23
1	" ..	F. G. *O'Bree*	1,282	23	1,305	24
35	" ..	W. Tatterson	1,282	22	1,304	25
6	" ..	C. R. Jones	1,216	69	1,285	26
12	" ..	A. H. Mould	1,197	79	1,276	27
3	" ..	T. A. Pettigrove ..	1,190	74	1,264	28
32	" ..	Gleadell Bros.	1,177	83	1,260	29
5	" ..	A. *Mowatt*	1,164	95	1,259	30
41	" ..	A. Ross	1,220	28	1,248	31
24	" ..	C. Pyke	1,188	55	1,243	32
13	" ..	H. Hanbury	1,158	79	1,237	33
34	" ..	W. A. Rennie	1,176	60	1,236	34
41	" ..	Doncaster Poultry Farm ..	1,166	68	1,234	35
48	" ..	Bennett and Chapman ..	1,207	23	1,230	36
28	" ..	Utility Poultry Farm ..	1,184	44	1,228	37
2	" ..	J. O. Armstrong ..	1,194	30	1,224	38
38	" ..	G. Hayman	1,191	29	1,220	39
18	" ..	All-lay Poultry Farm ..	1,172	35	1,207	40
43	" ..	G. Mayberry	1,135	67	1,202	41
42	" ..	E. W. Hippe	1,136	46	1,182	42
39	" ..	R. L. *Appleford* ..	1,106	45	1,151	43
31	" ..	E. H. Bridge	1,110	16	1,126	44
21	" ..	R. A. Lewis	1,093	30	1,123	45
19	" ..	A. Beer	1,050	67	1,117	46
50	" ..	F. G. Silbereisen ..	1,041	69	1,110	47
7	" ..	B. Cohen	1,015	70	1,085	48
46	" ..	C. L. Sharman	995	82	1,077	49
27	" ..	Walter M. Bayles ..	983	81	1,064	50
		Total	62,409	3,338	65,747	

Fourth Victorian Egg-laying Competition, 1914–1915—*continued.*

Pen No. (6 Birds).	Breed.	Owner.	Eggs Laid during Competition. 15th April to 14th March.	15th Mar. to 14th April.	Final Totals.	Position in Competition.
		LIGHT BREEDS—*continued.*				
		Dry Mash.				
60	White Leghorns ..	W. N. O'Mullane ..	1,593	106	1,699	1
66	" ..	E. A. Lawson	1,452	62	1,514	2
61	" ..	H. Hanbury	1 306	89	1,395	3
51	" ..	Moritz Bros.	1,339	55	1,394	4
53	" ..	C. Lawson	1,301	30	1,331	5
65	" ..	W. G. Osburne	1,263	67	1,330	6
59	" ..	F. G. Silberelsen ..	1,201	63	1,264	7
63	" ..	Hanslow Bros.	1,181	73	1,254	8
58	" .	Miss L. Stewart	1,218	28	1,246	9
62	" ..	A. Greenhalgh	1,183	51	1,234	10
68	" ..	E. W. Hippe ..	1,181	50	1,231	11
69	" ..	C. J. Beatty	1,143	64	1,207	12
70	" ..	W. H. Robbins ..	1,140	66	1,206	13
57	" .	J. Jackson . ..	1,110	70	1,180	14
64	" .	E. A. Carne ..	1,120	45	1,165	15
52	" ..	Myola Poultry Farm ..	1,124	22	1,146	16
67	" ..	Walter M. Bayles ..	1,090	52	1,142	17
54	" ..	G. Carter	1,098	6	1,104	18
56	" .	S. Brown	807	72	879	19
		Total	22,850	1,071	23,921	
		HEAVY BREEDS				
		Wet Mash.				
77	Black Orpingtons .	J. McAllan	1,451	111	1,562	1
71	" ..	J. Ogden	1,322	117	1,439	2
89	" ..	Marville Poultry Farm ..	1,278	95	1,373	3
88	" ..	H. H. Pump	1,291	46	1,337	4
87	" ..	A. Douglas	1,203	89	1,292	5
84	Rhode Island Reds	J. Mulgrove	1,195	79	1,274	6
81	Black Orpingtons ..	D. Fisher	1,191	70	1,261	7
76	" ..	W. P. Eckermann ..	1,164	56	1,220	8
82	" ..	J. H. Wright	1,143	63	1,206	9
73	" ..	J. A. McKinnon ..	1,114	87	1,201	10
72	" ..	T. W. Coto	1,111	88	1,199	11
75	" ..	Fairdeal Poultry Farm ..	1,124	58	1,182	12
74	" ..	S. Brown	1,086	45	1,131	13
83	" ..	Cowan Bros. . ..	947	59	1,006	14
85	Golden Wyandottes	J. C. Mickelburgh ..	855	81	936	15
79	Barred Plyth. Rocks	Bennett and Chapman ..	771	87	858	16
78	Red Sussex ..	Jorgen Anderson ..	805	50	855	17
86	Buff Wyandottes ..	W. G. Swift	590	52	642	18
		Total	19,641	1,333	20,974	
		Dry Mash.				
97	Black Orpingtons ..	J. McAllan	1,101	109	1,210	1
100	" ..	D. Fisher	1,120	58	1,178	2
98	" ..	A. Greenhalgh	1,078	90	1,168	3
90	" ..	J. H. Wright	1,087	55	1,142	4
91	" ..	C. E. Graham	1,000	73	1,073	5
96	Rhode Island Reds	Myola Poultry Farm ..	979	55	1,034	} 6
94	Black Orpingtons ..	T. W. Coto	963	71	1,034	} 6
92	" ..	Fairdeal Poultry Farm ..	925	91	1,016	8
93	" ..	Myola Poultry Farm ..	880	41	921	9
99	White Plyth. Rocks	Mrs. G. R. Bald ..	785	59	844	10
95	" ..	C. L. Hewitt	523	19	541	11
		Total	10,441	721	11,162	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

MANURING.

The expediency of adding food supplies to the soil will now come under the consideration of the fruitgrower. It is not wise to recommend any general manure, as soil and climatic conditions vary considerably throughout the State. Humus, in the form of any decayed animal or vegetable matter, may now be added, and it will prove beneficial and productive. Lime may also be applied at this time. The dominant influence of lime will always be felt in a beneficial manner in orchards, provided it be not used too frequently. The application should be made at the rate of about 4 or 5 cwt. per acre.

It is far more important, however, that the soil be placed in a perfect physical condition by draining, subsoiling, and thorough cultivation, so that the tree roots may derive the greatest possible benefit from the soil itself. Then, when that is done, the grower may turn to soil additions as a further means of increasing his yield.

Manuring, except with quick-acting manures, such as nitrate of soda, potash, and sulphate of ammonia, should be carried out in the autumn, and preferably before the autumn ploughing. There are several methods by which the soil may be enriched for orchard trees—humus may be added in the form of animal manures, green manures, plant or animal refuse; the trees may be stimulated by a chemical plant food; or the food in the soil may be assisted and enriched in a different manner each year, and so that it may not be overstocked with any one particular form of tree food.

CULTIVATION.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. The autumn ploughing may be as rough as possible, taking care to plough to the trees, so that the drainage furrow is left between the rows.

PESTS.

Orchards will benefit if an attack is now made upon the codlin moth. All hiding places, nooks and crannies, wherever the larvae have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

It is now a favorable time to spray the trees where such pests as Bryobia mite, woolly aphis, scale species, and peach aphis have been or are prevalent.

Any of the recognised sprays are suitable, these being red oil, crude petroleum, kerosene emulsion, or lime-sulphur wash. The latter wash is again becoming popular, partly owing to its effectiveness, and also to its possessing certain properties as a fungicide.

The Flower Garden.

The month of May is a suitable one for the preparation of new flower beds. In starting on this important work, the first essential is good drainage. The fertility of the soil depends so much on its ability to free itself of all surplus and unnecessary water, by being in a good mechanical condition. This is of far greater importance than increasing the value of the soil by the addition of organic manures. The latter is by no means to be despised, but a correct condition, with good drainage, is the first necessity.

The new beds should be well trenched into the clay or the subsoil. It is not advocated that the trenching shall be excessively deep. Much labour has been lost in the past by deep trenching, and no very definite results have been produced.

The subsoil surface should be trenched so that the soil moisture may soak into it, and the plant roots may be able to penetrate into the subsoil. Then the soil and loam should be thoroughly cultivated and broken up. These remarks apply especially to the preparation of rose beds. If new ground is being broken up, the addition of lime at the rate of 1 lb. to every 6 square yards will be a distinct advantage. The lime should be well worked into the soil. The addition of stable manures to the soil may now be carried out. Too heavy dressings are not advised, as an accumulation of manure in the soil is likely to set up sour and unhealthy soil conditions. The manure should be thoroughly mixed with the soil.

It is not too late to sow sweet pea seeds, but the best results come from early planting. The planting of these seeds should not be delayed. Sweet pea results are generally poor if the plants are overcrowded. The individual plants should be given ample room, planting the seeds at least an inch apart. The training of the young plant is also an important matter. It should not be allowed to trail or lie on the ground. As soon as the tendrils appear on the young plants, they should be given support, so that they may be encouraged in the climbing habit at once. A good sap flow is necessary to good growth, and the stem of the plant should be trained as upright as possible to allow of this. Stable manure is one of the most useful of plant foods for sweet peas, but if a chemical manure is needed, sulphate of potash in very small quantities may be used. It must be understood that this manure is used to produce good and free growth in the plant itself. If this be obtained, good flowers will naturally follow.

At the end of the month a start may be made with the autumn digging, pruning, and clearing up. Manure may be dug into the beds,

well below the surface. All leaves and light litter should also be dug in. If necessary, a light top dressing of lime may be given after the digging has been completed.

As much garden litter as can be saved should be rotted down for future use; the rough litter and strong stems should be burned, and the ashes returned to the soil.

Flowering shrubs should be pruned only after the flowering season for each plant has passed.

The Vegetable Garden.

The notes in the flower garden notes referring to the preparation of new beds apply to the kitchen section, this being the time for good soil work; only, where deep-rooting vegetables are to be grown, such as carrots and turnips, the soil and subsoil should be deeply worked, so as to allow a ready root run for these vegetables.

A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimize future attacks of insect and fungus pests.

All asparagus plots should be cleaned out, cut down, and kept in good order. A light dressing of stable manure may be given to the beds.

Plantings may be made of all seedlings, such as cabbage, cauliflower, lettuce, onions, &c., and seed of carrot, leek, lettuce, onion, peas, radish, turnip, parsnip, broad beans, &c., may be sown.

REMINDERS FOR JUNE.

LIVE STOCK.

HORSES.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. Calves should be kept in warm dry shed. Cows and heifers for early autumn calving may be put to the bull.

PIGS.—Supply plenty of bedding in warm, well-ventilated sties. Keep sties clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run. All liquid food should be given warm and feeding utensils kept scrupulously clean. (Read articles in *Journal* for April, 1912, and June, 1913.)

SHEEP.—Have the wool clipped from round the udders of all young lambing ewes. See to them early every morning. Do not fail to mark ram lambs at the earliest chance. Cut off ewes with oldest wether lambs to best fodder, these will be of extreme value when 60 lbs. live weight.

Overgrown hoofs are conducive to lameness and even foot-rot, whenever noticed trim into shape; lame ewes cannot thrive and fatten good lambs.

Foxes are most troublesome after drought periods. When lambs are found with usual fang punctures in the throat, cover from crows until evening. Shoot sparrows, handle them with fork and knife from first to last. Poison with powdered strychnine, one lot on the back of the tongue, another lot well in on the breast bone, each dose just what will cover nicely a threepenny-piece. At sundown place four or five sparrows all round the lamb at about 2 yards distance, some covered very slightly, and some lying on the surface. Take all ewes and lambs away. Every fox is not a lamb killer. The killer comes for warm blood, and after working about in search of the removed lambs, will sooner or later go to the spot he killed at the night before. Sparrows being a delicacy, the fox rarely ever gets more than a few chains away. It takes the blood of two lambs per night to satisfy a large dog fox. Poisoning lambs found dead accounts for scavenger foxes only.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and finish sowing of cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see *Journal* for February, 1915. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

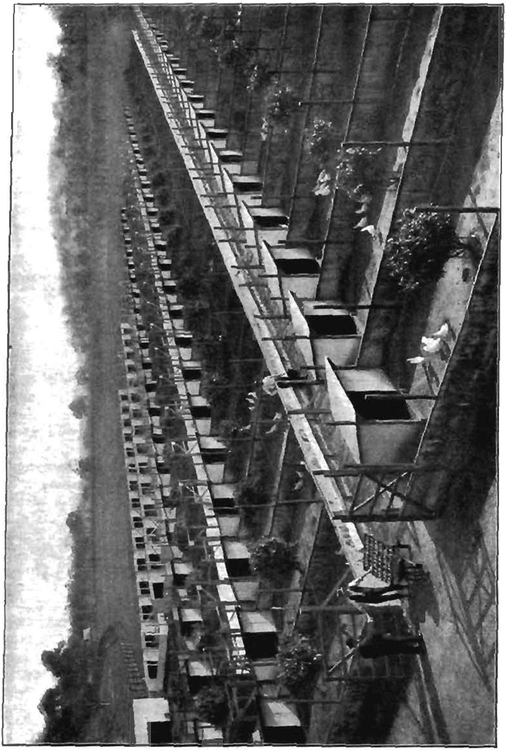
Vol. XIII. Part 6. 10th June, 1915.

REPORT ON THE FOURTH EGG-LAYING COMPETITION AT BURNLEY, 1914-15.

By A. Hart, Chief Poultry Expert.

In presenting the annual report on the Egg-laying Competition just concluded, I beg to bring under notice several valuable and important features in connexion with this test. Records have been broken, different systems of feeding have been successfully instituted, and the Light and Heavy Breeds have been tested singly. These different methods have brought the test into much prominence, and the result must be accepted as a certain proof of the value of the industry, when conducted on proper lines and under suitable conditions. The Egg-laying Competitions instituted by the Department have already been productive of much benefit to the industry, and the consistent and also rapid improvements in the egg production of the birds competing in these tests have been extremely satisfactory in every respect. The figures put up in the tests just concluded are in several instances not only records for our Commonwealth, but can also be classed as world's records. The value of these tests from an educational point of view, as well as from an experimental one, is of much benefit to the Poultry Industry generally. The public have the opportunity to visit Burnley and inspect the competing birds, seeing for themselves the conditions under which they are kept and fed. In this way useful and valuable instruction is provided, and an object-lesson furnished which all poultry-keepers may follow if they wish. The really excellent results which have attended the recent tests should be an incentive to increase the ranks of poultry-keepers. Although the present high prices of food may be a considerable handicap, many instances are recorded where poultry breeders are securing profitable returns, even under the prevailing conditions. A good proportion of these have profited by the information which has from time to time been

supplied to them, and also from the supervision extended by the departmental officer, and it is gratifying to find so many successes which are attributable to practical Government management.



View of the Competition Pens, Burnley.

Laying competitions in Victoria were first instituted in 1904-5. They were then conducted at Dookie Agricultural College, under the supervision of the Principal, Mr. H. Pye. The first test was won by White

Leghorns, the six birds producing 1,313 eggs for the twelve months. In 1905-6 Silver Wyandottes scored the leading award with 1,296 eggs, and White Leghorns were successful in 1907-8, producing 1,314 eggs. The tests were then discontinued at Dookie, and the first laying competitions held at Burnley under direct Government management took place during 1911-12. This test was won by six White Leghorns, producing 1,566 eggs in twelve months. All breeds were eligible to compete, and Black Orpingtons, Silver Wyandottes, Minorcas, Faverolles, White Wyandottes, and Golden Wyandottes entered into competition with White Leghorns, the latter winning by a big majority, and birds of the same variety being second. In the other breeds, Black Orpingtons put up the best results, producing 1,240 eggs in the 12 months. In the test of 1912-13, all breeds competed together, and all money prizes were won by White

Audience which attended Poultry Lecture and Demonstration by Messrs. Hart and Rintoul, at the Burnley School of Horticulture.

Leghorns. The winning score was 1,468 eggs, and the second was 1,454. In this test Black Orpingtons scored over the other heavy breeds, the six birds producing 1,245 eggs. Although the leading figures were behind those of the previous year, the total egg production of the seventy pens was better, an increase of ten eggs per pen being received. The test of 1913-14 was again a decided victory for White Leghorns, birds of this variety gaining the thirty-nine leading positions. The figures secured by the winners were first class. The six birds produced 1,667 eggs for the year, this being an average of 277 per bird. The sixty-three pens of six birds each averaged over 212 eggs per bird. When it is taken into consideration that this included all breeds, the result must be classed as a really good average.

In the tests of 1914-15 four classes were provided, with the object of comparison as to the merits of the different breeds, and also the various methods of feeding. Light breeds had two classes, and heavy breeds a similar number, and the entries made up a total of ninety-eight in all. This included fifty pens of White Leghorns fed on wet mash, nineteen pens of White Leghorns fed on dry mash, eighteen pens (heavy breeds) fed on wet mash, and eleven pens (heavy breeds) fed on dry mash. The object of providing separate tests for light and heavy breeds respectively was to encourage entries in the heavy breeds. In all previous tests the whole of the prize money and leading positions were gained by White Leghorns. It was considered that the all-round and utility breeds should be given their opportunity, as the competitions were not only instituted to increase the egg production of all and every breed, but were also intended to bring the poultry industry into prominence, and educate the public as to the respective value of the various varieties. It was admitted that the heavy breeds had no chance of winning when in

Good Laying Type of Head, one of six White Leghorns, with an average of 283 eggs in 12 months.

Bad Laying Type of Head, one of six White Leghorns, with an average of 144 eggs in 12 months.

competition with high-grade egg-producing White Leghorns of the present improved laying strains. But the merits of the heavy breeds as table birds had also to be considered, and the incentive for breeders to improve their stock was provided by the insertion of separate classes in the competition. An indication of the popularity of these tests can be noted by the fact that last year the entries received were very much larger than the available pens, and a good number of owners were disappointed.

The tests were conducted on very methodical and up-to-date lines. The birds were kept in houses and pens constructed on cheap and also very efficient patterns, which can easily be copied by any poultry-keeper at a moderate cost. Warmth and freedom from draughts during the winter months were two of the special features of this house, and plenty of shade and ventilation was also available during the summer. The feeding was performed with regularity, and the various quantities of

different foods were carefully weighed and mixed. The dry mash tests were conducted for the first time in Victoria, the object being to provide authentic information as to their relative qualities in comparison with the wet mash. The result was very satisfactory, and to this method of feeding can be given the honour of producing the world's record from six birds. They produced 1,699 eggs for the twelve months, this being *an average of over 283 eggs per bird, and establishing* a record, which, in the past, was regarded as an utter impossibility. The laying from this pen was exceptionally heavy, and the eggs produced were of good average size. In comparing the results of the whole of the White Leghorns fed on dry mash with those fed on wet mash, the latter returned

How to increase Egg Production and the Size of the Egg.—Single Test each Pullet for one year.

over 50 eggs more from each pen. The cost of food was about the same, but the dry mash birds had the advantage in respect to labour, and this would probably work out about equal. In the heavy breeds it was not so successful, the result indicating that this system is not so suitable for soft-feathered birds. There is one point, however, which must not be overlooked in these tests. Breeders viewed the dry mash test with a considerable amount of doubt, and for this reason, in every instance, they placed their first choice of six pullets in the wet mash test, and entered their second string in the dry mash. When this is explained, the difference in egg production should not be estimated to work out so high as it appears to do at first sight. When a comparison of the figures can be

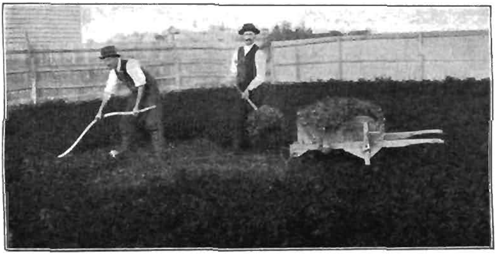
made of the birds which are now competing in both sections, I feel confident that the result will place the dry mash birds in a much better position than that shown in the recent test.

The weather conditions during the test just concluded were not conducive to the production of sensational averages. The dry winter months checked laying to some extent, but towards the last months of 1914 the conditions were more favorable. By careful and regular attention, and a liberal supply of mixed foods, the birds were kept up to concert pitch, and at that time breaking of records was anticipated. But sudden weather changes brought about a set-back in several pens which were well up, and as some of the birds went into moult, it handicapped their chances to a great extent. But even with these drawbacks the final results were above expectations, and the averages put up by the whole of the competing birds were very satisfactory. In the light breeds very few instances of broodiness were recorded. In the heavy breeds, however, broodiness was very prevalent. Of course, this it a natural condition with soft-feathered birds, but it told greatly against the egg production of several pens where cases were numerous. During the latter part of the competition the birds were under the care of Mr. J. T. Macaulay, and to his efficient management and regular attention must be given much of the credit for the excellent results attained. It may also be noted that the official figures obtained under Government control are unanimously accepted as authentic and reliable, this indicating that they are compiled and written up with both care and accuracy.

In the light breeds (wet mash) the whole of the fifty pens put up very satisfactory figures, the 300 birds averaging over 219 eggs each. This was a consistent return from such a large number of birds, and proves that high-grade egg-producing stock is now kept and owned by many poultry breeders. The winning pen put up a good performance, and practically won through excellent egg production during the last five weeks of the test, constitution and condition standing to them right to the end. The six birds produced 1,633 eggs in the twelve months, leading the second pen by forty eggs. The latter birds were, however, handicapped by moulting conditions. The third pen was only six eggs behind the second, and the average laying from the three pens (eighteen birds) was over 267 per bird. In the dry mash test (light breeds), the winning pen established a "world's record," the six birds producing 1,699 eggs in the twelve months, and leading the second pen by 185 eggs. A record of this kind must tend to bring Victorian White Leghorns into much prominence, and a strong point in connexion with the achievement is the fact that the owner of the winning birds was practically a beginner. The winners were purchased by Mr. E. A. Lawson for the sum of £75, and Mr. J. H. Gill's third-prize wet-mash pen was sold for £50. Mrs. H. Stevenson refused £60 for her pen. This proves the great value placed by breeders on high-grade egg producers. The rest of the White Leghorns in the dry mash did fairly well, and the total average egg production was as high as could be anticipated.

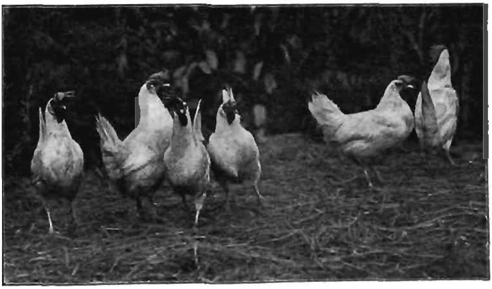
In the heavy breeds (wet mash) the leading birds put up an excellent performance. The six birds produced 1,562 eggs, averaging over 260 eggs per bird for the twelve months. The second pen laid 1,439 eggs, being 123 behind the winners. Black Orpingtons held the five leading positions, the sixth being taken by Rhode Island Reds, who proved their

worth as egg producers by averaging 212 per bird. The aggregate figures of this test were considerably reduced through some of the competing pens containing very indifferent layers. In the heavy breeds (dry mash) Black Orpingtons held the five leading positions, the sixth



How to make Poultry Pay: Grow plenty of Lucerne.

going to Rhode Island Reds. The winning birds produced 1,210 eggs for the twelve months, the second birds being credited with 1,178. A few very poor layers were competing in this test, and this affected the total average egg production.



First Prize Pen White Leghorns, Light Breeds, Dry Mash Section, owned by W. N. O'Mullane; 1,699 eggs for 12 months' test, constituting Official World's Record.

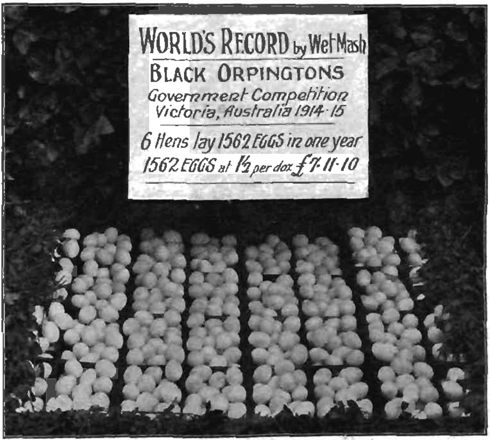
The number of eggs produced by the 588 birds competing in the four tests was 121,804. Their market value was 1s. 2d. per dozen, which works out an average of 20s. 3d. per bird. As this includes all breeds that competed, among which were birds that did not average 100 eggs

each, the figures must be regarded as particularly good. The result of this test, whether the figures are taken for each single breed or the whole

First Prize Pen White Leghorns, Light Breeds, Wet Mash Section, owned by Mrs. H. Stevenson; 1,633 eggs for twelve months' test.

collectively, are very satisfactory, and prove that good work is being done through the medium of these annual tests. Individual high tests

First Prize Pen Black Orpingtons, Heavy Breeds, Wet Mash Section, owned by J. McAllan; 1,562 eggs for 12 months' test. Official World's Record for Heavy Breeds



are certainly very encouraging. But "one swallow does not make a summer," and the object of laying competitions is not to only indicate the leading pens of egg producers. They are also equally valuable in

effecting a decided improvement in the whole of the competing birds, and in this way must be regarded as especially beneficial to the poultry industry generally, improving the flocks of layers in various parts of the State by the distribution of high-grade egg producers. In this age of improvement, unless poultry-keepers take the special advantages that are offered to them in the way of reliable and prolific egg-producing stock, they are certain to be left out in the cold.

In connexion with the tests that are being annually conducted at Burnley, I would suggest that single bird testing be included in the competition, in order to make the records more complete and valuable. This has been practised successfully in both New South Wales and South Australia, and in the former State a White Leghorn hen tested singly has put up a world's record under Government supervision. It is quite certain that the egg production of the six birds included in one pen will vary, and in this case the highest production from one hen cannot be indicated. If the winning White Leghorns in the recent dry mash test

First Prize Pen Black Orpingtons, Heavy Breeds, Dry Mash Section, owned by J. McAllan; 1,210 eggs for 12 months' test.

had been tested singly, it is quite possible that at least one of them would be credited with 300 eggs. A record of this kind would bring our Victorian competitions into great prominence, and it would also insure plenty of outside demand for our stock. The birds which are competing in other tests could be penned singly, or a special class could be provided, and I feel certain that the result would be alike satisfactory to the Department and to the poultry industry generally.

The competitions which started at Burnley on 15th April are progressing satisfactorily. In previous tests a number of the owners did not, apparently, exercise enough care in the selection of their birds, uniformity and even type not receiving sufficient consideration. But, judging by the general appearance of the birds, this defect has been remedied this year, and, if appearances count for anything, they do not include any inferior stock. The owners are becoming educated as to what is required, and the average quality of the whole of the birds is much better and more even than in former tests. The packing up of

the birds from the test just concluded, and the conveying of them to their respective destinations, were completed quickly and effectively. Many letters of appreciation have been received commenting on the excellent condition in which the birds arrived home.

In conclusion, I would draw attention to the fact that Victoria possesses special advantages in respect to poultry-keeping, and for this reason the efforts of the Department of Agriculture in fostering the industry must prove successful. The present time has many drawbacks, particularly the scarcity and high cost of food, but it is to be hoped that in the near future normal conditions will prevail, when the excellent work which has been done by the Department will meet with its due reward, and our poultry industry will assume dimensions which will enable us to make poultry-keeping a very large source of revenue to the State.

FEEDING METHODS.

FORMULA OF WET MASH.

Bran	..	..	..	16 lb.
Ground oats	..	.	..	4 ,,
Pollard	..	..	..	20 ,,
Peameal	..	..	..	4 ,,
Oatmeal pollard		..	..	4 ,,
Minced liver		..	..	8 ,,

The whole is mixed together with liver soup and given warm, in a crumbly condition. About 2 ozs. is given to each bird in the morning and 1 oz. at midday, mixed with green stuff, consisting of chaffed green lucerne and silver beet.

Evening Meal.—Wheat, oats, crushed maize, varied according to appetite and weather conditions. About 11 ozs. to 13 ozs. is given to each pen of six birds.

Cut onions given occasionally, once a week, as a tonic.

FORMULA OF DRY MASH.

This formula, introduced by the Chief Poultry Expert, resulted in a record number of eggs being produced, viz., W. N. O'Mullane's pen, 1,699 eggs for twelve months' test:—

1. Bran, 54½ lb.; wheaten pollard, 53½ lb.; lucerne pollard, 14 lb.; peameal, 22 lb.; oaten meal pollard, 11 lb.; ground oats (with portion of hulls removed), 19¾ lb.; dry molasses or black sugar, 1½ lb.; meat, at 8 a.m., about 3 ozs. of cooked minced liver to each pen. One ounce of salt is allowed to every hundred birds, and is mixed with the liver. Quantity of dry mash used per day for a pen of six birds, light breeds, is 12 ozs., including minced liver.

2. *Green food.*—Fresh-cut lucerne and silver beet are fed liberally at midday. NOTE.—Everything is fed at a regular hour, and hopper feeding saves labour. It is very noticeable that the birds in the dry mash system of feeding consume more water than those on the wet mash.

It is, therefore, necessary to see that the birds have a plentiful and regular supply of water, which is cool and kept out of the sun.

3. Quantity of grain used per day per pen of six birds, light breeds, dry mashes, 11 to 13 ozs., according to appetite and weather conditions. This grain is fed about 4.30 p.m. every afternoon.

4. *Labour Saving.*—The attention needed in wet and dry mash systems of feeding is certainly in favour of the dry mash. In addition to the saving in time and labour, the birds can have their morning meal as early as they wish, which is not the case always with the wet mash system. If a tired attendant sleeps late the birds suffer in consequence.

5. *Appearance.*—The hens in the dry mash pens appear hardier and tighter in the feather than those in the wet, and in normal weather are

To get Best Results out of Hopper Feeding, Chickens must be reared on Dry Mash.

brighter in appearance, and not affected to the same degree by a cold snap.

6. *Handling.*—The birds fed on dry mash handle better, and are firmer in condition than those fed on wet mash.

7. We should like to call attention here to the number of cases of broodiness in White Leghorns, and would suggest as a remedy that breeders should test their breeding birds for twelve months, and discard any that show any tendency in that direction. Pullets tested for a year would make ideal hens for breeding in the second season, and aid in building up stamina. Breeding from first year's stock has many drawbacks.

FIVE WORLD'S RECORDS ESTABLISHED,

Competition 1914-15.

(1) Twelve Months—Dry Mash.

6 White Leghorns, W. N. O'Mullane, 1,699 eggs.

(2) Greatest Value of Eggs, Twelve Months.

6 White Leghorns, W. N. O'Mullane, $141\frac{7}{12}$ Eggs at 1s. 2d per doz = £8 5s. 2d.

(3) Twelve Months, Heavy Breeds—Wet Mash.

6 Black Orpingtons, J. McAllan, 1,562 eggs.

(4) Four Months' Winter Test, Light Breeds—Wet Mash.

6 White Leghorns, J. H. Gill, 565 eggs.

(5) Four Months' Winter Test, Heavy Breeds—Wet Mash.

6 Black Orpingtons, J. McAllan, 502 eggs.

NOTES.

The leading ten pens in light breeds, wet mash, have an average of 1,527 eggs per pen of six birds.

Average number of eggs per hen (588 birds) throughout the competition, 207.

Total number of eggs laid by 588 birds during twelve months, 121,804; price realized, at 1s. 2d. per dozen, £592 2s. 1d.

The winning pens in each section are as follows:—

1. Light Breeds, Wet Mash ..	Mrs H. Stevenson ..	1,633	Eggs (White Leghorns)
2. ,, ,, ,, ,, ..	E. A. Lawson ..	1,593	,, ,, ,,
3. ,, ,, ,, ,, ..	J. H. Gill ..	1,587	,, ,, ,,
1. Light Breeds, Dry Mash ..	W. N. O'Mullane ..	1,699	Eggs (White Leghorns)
2. ,, ,, ,, ,, ..	E. A. Lawson ..	1,514	,, ,, ,,
3. ,, ,, ,, ,, ..	H. Hanbury ..	1,395	,, ,, ,,
1. Heavy Breeds, Wet Mash ..	J. McAllan ..	1,562	Eggs (Black Orpingtons)
2. ,, ,, ,, ,, ..	J. Ogden	1,439	,, ,, ,,
3. ,, ,, ,, ,, ..	Marville Poultry Farm	1,373	,, ,, ,,
1. Heavy Breeds, Dry Mash ..	J. McAllan ..	1,210	Eggs (Black Orpingtons)
2. ,, ,, ,, ,, ..	B. Fisher	1,178	,, ,, ,,
3. ,, ,, ,, ,, ..	A. Greenhalgh ..	1,168	,, ,, ,,

The winning pens for the greatest total number of eggs laid by a pen during the first four months of the competition (winter test):—

LIGHT BREEDS.

1. White Leghorns ..	J. H. Gill ..	565	Eggs
2. ,, ,, ..	E. A. Lawson ..	533	,,

HEAVY BREEDS.

1. Black Orpingtons ..	J. McAllan ..	502	Eggs
2. ,, ,, ..	J. Ogden ..	494	,,

Heaviest eggs—average weight—Moritz Bros., 2·131 oz.

LIGHT BREEDS—WET MASH.

Owner.	Breed	1914. April.	1914. May.	1914. June.	1914. July.	1914. August.	1914. September.	1914. October.	1914. November.	1914. December.	1915. January.	1915. February.	1915. March.	1915. April.	Total.	Position in Competition.
Mrs. H. Stevenson ..	White Leghorns	51	140	122	83	123	153	163	157	156	159	132	143	51	1,633	1
E. A. Lawson ..	.. ..	73	137	130	124	154	147	169	143	159	137	122	80	18	1,593	2
J. H. Gill ..	.. ..	61	151	147	139	142	145	102	146	150	139	107	79	19	1,587	3
R. Hay ..	.. ..	64	129	123	125	133	132	135	135	147	134	116	118	36	1,527	4
A. R. Simon ..	.. ..	56	121	100	135	141	139	148	143	149	132	100	115	42	1,521	5
J. J. West ..	.. ..	79	140	100	119	147	138	137	125	148	126	102	115	26	1,502	6
F. Doldissen ..	.. ..	52	126	114	87	144	135	152	132	140	142	120	108	34	1,486	7
J. Schwabb	.. ..	25	118	131	116	137	144	144	109	135	133	122	124	40	1,478	8
C. J. Jackson ..	.. ..	42	108	88	88	135	136	154	152	156	144	132	105	37	1,477	9
Marville Poultry Farm	.. ..	61	114	88	113	115	135	154	135	147	146	125	111	31	1,475	10
W. G. Osburne ..	.. ..	40	101	105	110	144	144	152	145	133	130	118	104	28	1,454	11
F. W. Brine ..	.. ..	22	72	84	101	123	143	153	147	161	117	112	129	49	1,413	12
H. C. Brock .	.. ..	57	134	105	95	106	136	143	134	141	138	112	79	17	1,397	13
S. Brown .	.. ..	48	117	129	106	121	140	126	140	127	131	109	92	9	1,395	14
V. Little ..	.. ..	31	99	124	113	132	140	137	132	138	125	104	97	19	1,391	15
S. Buscumb ..	.. ..	53	86	94	113	115	134	144	136	143	130	124	102	14	1,388	16
Giddy and Son ..	.. ..	37	107	119	88	126	138	151	149	151	140	104	64	6	1,380	17
O. W. Robbins .	.. ..	24	73	103	102	121	127	144	138	139	139	113	113	41	1,377	18
A. W. Hall ..	.. ..	19	53	73	87	124	138	145	146	154	152	134	128	12	1,365	19
B. Mitchell .	.. ..	37	103	51	73	130	135	150	124	140	143	128	118	25	1,363	20 (tie)
W. O. Swift .	.. ..	16	83	93	123	129	132	136	130	136	134	112	102	37	1,363	20 (tie)
E. Waldon .	.. ..	2	82	107	109	137	144	155	128	128	126	120	92	30	1,360	22
F. C. Western ..	.. ..	..	18	90	124	132	141	155	118	130	150	119	116	26	1,325	23
F. G. O'Bree ..	.. ..	42	87	87	78	126	142	154	127	151	133	109	69	..	1,305	24
W. Tatterson ..	.. ..	42	109	98	115	137	135	144	130	121	112	99	61	1	1,304	25
C. R. Jones ..	.. ..	37	69	69	87	116	132	141	143	133	125	110	89	34	1,285	26

LIGHT BREEDS—WET MASH—*continued.*

Owner.	Breed.	1914. April.	May.	June.	July.	August.	September.	October.	November.	December.	1915. January.	February.	March.	April.	Total.	Position in Competition.
A. H. Mould ..	White Leghorns	33	100	121	100	112	131	138	88	121	116	86	104	26	1,276	27
T. A. Pettigrove ..	,, ..	57	127	104	98	111	112	128	89	101	107	105	100	25	1,264	28
Gleadell Bros. ..	,, ..	13	56	90	94	102	126	146	125	130	133	112	101	32	1,260	29
A. Mowatt ..	,, ..	14	26	20	92	135	142	145	141	144	128	115	109	39	1,259	30
A. Ross ..	,, ..	48	111	103	122	133	128	133	128	115	98	76	45	8	1,248	31
C. Pyke ..	,, ..	35	85	81	80	123	131	145	143	135	109	87	69	20	1,243	32
H. Hanbury ..	,, ..	10	76	119	108	113	122	116	114	130	109	101	86	33	1,237	33
W. A. Rennie ..	,, ..	24	98	103	95	118	120	130	123	122	124	74	78	18	1,236	34
Doncaster Poultry Farm	,, ..	21	29	45	84	117	134	155	146	143	144	95	101	20	1,234	35
Bennett and Chapman	,, ..	15	58	110	98	132	126	126	115	145	148	100	48	9	1,230	36
Utility Poultry Farm	,, ..	28	96	103	83	121	130	147	128	123	116	75	57	21	1,228	37
J. C. Armstrong ..	,, ..	38	73	76	101	116	140	148	116	138	111	107	55	5	1,224	38
G. Hayman ..	,, ..	38	42	105	74	88	141	157	146	139	125	101	55	9	1,220	39
All Lay Poultry Farm	,, ..	34	74	44	49	134	133	152	131	131	131	120	66	8	1,207	40
G. Mayberry ..	,, ..	15	38	60	64	109	118	139	132	144	142	119	106	16	1,202	41
E. W. Hippo ..	,, ..	30	73	55	67	142	134	141	128	127	124	88	55	18	1,182	42
R. L. Appleford ..	,, ..	23	35	42	50	97	132	144	142	141	138	118	71	18	1,151	43
E. H. Bridge ..	,, ..	37	81	63	51	93	129	144	133	140	123	98	25	9	1,126	44
R. A. Lewis ..	,, ..	17	55	61	99	93	129	129	111	117	121	116	65	10	1,123	45
A. Beer ..	,, ..	43	62	34	55	112	131	122	106	122	117	103	91	19	1,117	46
F. G. Silbereison ..	,, ..	14	28	35	36	100	132	135	129	142	132	116	80	31	1,110	47
B. Cohen ..	,, ..	16	41	16	35	87	114	118	133	144	144	116	101	20	1,085	48
C. L. Sharman ..	,, ..	20	36	16	28	124	123	114	110	127	134	113	90	36	1,077	49
W. M. Bayles ..	,, ..	3	13	87	58	92	109	120	121	116	115	107	89	34	1,064	50
		1,703	4,190	4,376	4,574	6,100	6,681	7,120	6,522	6,856	6,506	5,453	4,500	1,166	65,747	

LIGHT BREEDS—DRY MASH.

Owner.	Breed.	1914. April.	May.	June.	July.	August.	September.	October.	November.	December.	1915. January.	February.	March.	April.	Total.	Position in Competition.
W. N. O'Mullane ..	White Leghorns	52	136	117	150	152	151	170	163	147	149	139	120	47	1,699	1
E. A. Lawson ..	.. ..	50	120	134	134	154	150	156	149	140	135	103	65	24	1,514	2
H. Hanbury ..	.. ..	21	54	95	131	143	149	143	117	145	139	122	102	34	1,395	3
Moritz Bros. ..	.. ..	19	117	105	77	134	144	158	128	151	132	131	81	17	1,394	4
C. Lawson ..	.. ..	52	122	109	113	131	137	146	120	113	117	96	65	10	1,331	5
W. G. Osburne ..	.. ..	24	96	136	146	148	139	137	124	123	94	66	70	27	1,330	6
F. G. Silbereisen ..	.. ..	48	41	18	33	134	158	162	153	160	140	111	94	12	1,264	7
Hanslow Bros. ..	.. ..	8	70	88	108	134	121	145	133	120	110	103	82	32	1,254	8
Miss L. Stewart ..	.. ..	57	114	97	95	138	128	141	118	114	119	73	41	11	1,246	9
A. Greenhalgh ..	.. ..	13	112	77	43	93	134	147	133	141	136	109	77	19	1,234	10
E. W. Hippe ..	.. ..	33	100	101	78	68	114	140	139	135	134	103	71	15	1,231	11
C. J. Beatty ..	.. ..	39	76	62	58	99	134	133	116	130	131	115	91	23	1,207	12
W. H. Robbins ..	.. ..	17	28	62	106	130	142	136	128	122	120	104	86	25	1,206	13
J. Jackson ..	.. ..	25	67	98	53	90	129	130	123	125	117	97	104	22	11,80	14
E. A. Carne ..	.. ..	46	60	29	60	134	148	140	129	121	115	96	83	4	1,165	15
Myola Poultry Farm	.. ..	18	25	56	93	137	146	148	143	121	116	89	46	8	1,146	16
W. M. Bayles ..	.. ..	10	27	71	99	117	112	128	112	137	144	92	74	19	1,142	17
G. Carter ..	.. ..	2	21	73	96	118	147	155	135	119	112	87	30	..	1,104	18
S. Brown ..	.. ..	20	5	30	54	65	107	118	90	105	96	85	76	28	879	19
		554	1,391	1,558	1,727	2,319	2,590	2,733	2,453	2,469	2,356	1,921	1,473	377	23,921	

HEAVY BREEDS—WET MASH.

Owner.	Breed.	1914.									1915.				Total.	Position in Competition.
		April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.		
J. McAllan ..	Black Orpingtons	62	118	137	121	145	152	145	118	139	143	112	121	49	1,562	1
J. Ogden ..	,, ..	41	121	130	139	138	135	129	99	123	122	98	107	57	1,439	2
Marville Poultry Farm	,, ..	25	70	117	155	160	149	142	117	114	94	88	96	46	1,373	3
H. H. Pump ..	,, ..	29	115	112	132	135	148	141	99	137	104	96	73	16	1,337	4
A. Douglas ..	,, ..	48	63	35	80	132	143	138	130	139	130	122	96	36	1,292	5
J. Mulgrove ..	Rhode Island Reds	60	95	111	124	129	136	121	88	115	92	93	80	30	1,274	6
D. Fisher ..	Black Orpingtons	63	113	127	104	144	115	101	95	88	97	89	92	33	1,261	7
W. P. Eckermann ..	,, ..	17	80	114	132	108	125	116	105	121	114	98	67	23	1,220	8
J. H. Wright ..	,, ..	42	132	97	101	146	138	116	90	86	87	77	74	20	1,206	9
J. A. McKinnon ..	,, ..	35	56	55	86	132	138	128	108	110	117	105	93	38	1,201	10
T. W. Coto ..	,, ..	31	85	114	69	134	122	100	99	101	112	85	101	46	1,199	11
Fairdeal Poultry Farm	,, ..	33	84	84	91	138	122	125	107	103	115	76	82	22	1,182	12
S. Brown ..	,, ..	23	87	87	109	130	125	112	91	94	101	92	57	23	1,131	13
Cowan Bros ..	,, ..	14	79	81	133	118	92	94	78	86	79	68	73	11	1,006	14
J. C. Mickelburgh ..	Golden Wyandottes	9	33	86	74	116	101	98	64	82	77	54	96	40	936	15
Bennett and Chapman	Barred Plymouth Rocks	..	5	43	92	60	120	97	74	92	100	57	86	32	858	16
Jorgen Anderson ..	Red Sussex ..	41	103	57	62	96	76	67	56	74	67	70	74	12	855	17
W. G. Swift ..	Buff Wyandottes	6	61	55	44	58	62	52	43	56	64	59	58	24	642	18
		579	1,500	1,642	1,848	2,219	2,199	2,022	1,661	1,860	1,815	1,539	1,526	564	20,974	

HEAVY BREEDS—DRY MASH.

Owner.	Breed.	1914. April.	May.	June.	July.	August.	September.	October.	November.	December.	1915. January.	February.	March.	April.	Total.	Position in Competition.
J. McAllan	Black Orpingtons	9	80	94	96	134	126	127	87	111	77	100	124	45	1,210	1
D. Fisher ..	,, ..	58	124	77	113	136	122	109	88	105	87	59	73	27	1,178	2
A. Greenhalgh ..	,, ..	37	119	101	63	85	127	128	92	107	100	84	86	39	1,168	3
J. H. Wright ..	,, ..	10	35	65	144	139	152	133	93	110	92	87	56	26	1,142	4
C. E. Graham ..	,, ..	34	34	73	69	145	110	136	75	98	93	89	84	33	1,073	5
Myola Poultry Farm	Rhode Island Reds	9	4	52	134	112	134	107	91	110	90	94	77	20	1,034	} 6
T. W. Coto ..	Black Orpingtons	47	120	105	78	119	82	102	72	76	71	59	77	26	1,034	}
Fairdeal Poultry Farm	,, ..	25	36	41	72	115	124	123	93	99	95	75	73	45	1,016	8
Myola Poultry Farm	,, ..	4	2	48	117	117	108	115	88	91	95	72	44	20	921	9
Mrs. G. R. Bald ..	White Plymouth Rocks	..	..	26	45	94	123	127	71	95	103	81	55	24	844	10
C. L. Hewitt ..	,, ..	..	9	22	20	24	83	87	69	82	52	49	41	4	542	11
		233	563	704	951	1,220	1,291	1,294	910	1,084	955	849	790	309	11,162	

Past Records.

Held under Government Supervision.

For Six Pullets in Twelve Months.

South Australia.—Highest record (White Leghorns), 1,589, R. Walsh, Victoria.

Western Australia.—Highest record, 1,564, A. H. Padman, South Australia.

New South Wales.—Highest record, 1,541, S. Champion, New South Wales.

Queensland.—Highest record, 1,564, Moritz Brothers, South Australia.

Victoria.—Highest record, 1,699, W. N. O'Mullane, Victoria.

Victoria.—Highest record previously, 1,667, J. H. Gill, Victoria.

New Zealand.—Highest record, 1,632, W. A. Nixon, New Zealand.

Victoria.—Highest record (Black Orpingtons), 1,562, J. McAllan, Victoria.

AMORTIZATION.

This is a term well understood in financial circles, but not generally by people who are not engaged in financial transactions. Briefly explained, it is a scheme for paying a debt in small instalments. For example, if a man should borrow £400 at 6 per cent. interest, and agree to pay £28 a year until it was paid up, it is clear that interest for the first year would be £24, and he would pay £4 on the principal. The second year the interest would be slightly reduced, and the amount paid on the principal would be a little larger; and the end of about thirty-four years the entire debt would be paid off.

SERICULTURE.

Young seedling plants of the White Mulberry Tree have been imported by the Department from France and may be obtained by the Public at the rate of one penny each for small quantities or 7s. 6d. per 100. Application should be made to the Principal, School of Horticulture, Burnley.

EXPERIMENTS IN THE CULTIVATION OF POTATOES, 1914-15.

By J. T. Ramsay, Potato Expert.

The results of experiments in potato cultivation carried out by the Department during the season 1914-15 are herewith presented.

These trials were conducted on two separate areas—one at the Government Nursery, Bamawm, and the other at the Labour Colony, Leongatha.

Bamawm Area.

The Bamawm plot was grown under irrigation, and the object aimed at in carrying out the trials was to test—

(1) The difference resulting from the application of various manures.

(2) The comparative values of immature and ripe tubers for seed.

(3) The merits of cut and uncut seed.

(4) Whether spring planting or autumn planting of potatoes in the irrigation districts was most profitable.

The plot was planted late in July, 1914, and harvested early in January, 1915. Owing to the lack of water for irrigation, the autumn crop test was for this season abandoned.

The following were the results obtained:—

Ripe Seed Planted Whole.

—	Large. Yield per acre. Tons	cwt.	lbs.	Small. Yield per acre. Tons	cwt.	lbs.	Total Weight. Yield per acre. Tons	cwt.	lbs.
No manure	2	0	110	1	8	104	3	9	102
2 cwt. Super.	1	3	84	1	6	58	3	0	30
2 cwt. Super. .. / 1 „ S. Potash / 1 „ S. Ammonia	3	17	6	1	13	84	5	10	100

Ripe Seed Cut.

—	Large. Yield per acre. Tons	cwt.	lbs.	Small. Yield per acre. Tons	cwt.	lbs.	Total Weight. Yield per acre. Tons	cwt.	lbs.
No manure	1	8	104	0	19	32	2	8	24
2 cwt. Super	0	9	72	0	7	26	0	16	98
2 cwt. Super. .. / 1 „ S. Potash	1	18	64	1	1	78	2	0	30

IMMATURE SEED PLANTED WHOLE.

—	Large.			Small.			Total		
	Yield per acre.			*Yield per acre.*			*Yield per acre.*		
	Tons	cwt.	lbs.	Tons	cwt.	lbs.	Tons	cwt.	lbs.
No manure	3	19	62	0	16	98	4	16	48
2 cwt. Super.	4	4	42	0	16	98	5	1	28
2 cwt. Super. .. / 1 „ S. Potash / 1 „ S. Ammonia	5	6	8	1		140	6	15	0

IMMATURE SEED CUT.

—	Large.			Small.			Total.		
	Yield per acre.			Yield per acre.			Yield per acre.		
	Tons	cwt.	lbs.	Tons	cwt.	lbs.	Tons	cwt.	lbs.
No manure	2	17	96	0	14	52	3	12	36
2 cwt. Super. .. .	2	17	96	0	12	6	3	9	102
2 cwt. Super. .. / 1 „ S. Potash / 1 „ S. Ammonia	6	0	60	1	4	12	7	4	72

View of Experimental Area, Leongatha.

AVERAGE RETURNS PER ACRE OF THE DIFFERENT CLASSES OF SEED UNDER ALL MANURES.

	Tons	cwt.	lbs.
Ripe seed whole	4	0	40
Ripe seed cut	1	15	13
Immature seed whole	5	10	100
Immature seed cut	4	15	70

From these figures it will be seen that immature seed proved considerably better than ripe seed in this test. Whole seed in both cases yielded better results than that which was cut, but in this connexion the dryness of the ground at the time of planting, no doubt, had considerable influence.

Regarding the manuring, superphosphate, when applied alone, in the case of plots 1 and 2, only succeeded in reducing the yield, but in all cases where the complete manure was applied a marked increase resulted. Even the least of these increases, viz., plot 1, 10½ cwt. over the unmanured section, more than paid for the cost of the manure, while in plot 4 the full manure was responsible for an increased yield of over 3 tons per acre.

Leongatha Area.

The objects aimed at in conducting this series of experiments were as follows:—

(1) The relative values of mature and immature potatoes for seed purposes, both with and without manures being used.
(2) The effect of dipping seed potatoes in an antiseptic solution (*a*) as a preventive of scab, and as to (*b*) its effect on the yield per acre.
(3) The effect of spraying the growing crop (*a*) as a preventive of blight, and (*b*) the effect on the yield per acre.
(4) The effect on the crop of phosphatic potassic and nitrogenous manures, singly and in combination.
(5) The prolificacy of different varieties.
(6) The prolificacy of seedlings propagated by Dr. Wilson, of St. Andrews, Scotland, grown here for the third season.

The soil on this area is a friable chocolate loam, well drained naturally, the physical character of which is well suited to the requirements of the potato crop, and is typical of a large area of country in the south-eastern portion of the State.

Samples were submitted to the chemist of the Department for analysis, who reported the following:—

Report on sample of soil and sub-soil from Leongatha Labour Colony—

	Soil, 7"–8".	Sub-soil, 7"–8".	A good soil should contain—
		Parts per 100,000.	
Nitrogen	280	126	150
Phosphoric acid	86	60	150
Potash	124	101	250
Lime	430	232	500
Magnesia	344	237	Not more than lime
Chlorine	9	6	Not more than 35
Reaction	Slightly acid	Slightly acid	Neutral

Colour of soil—dark chocolate clay loam of a fairly friable consistency.

This is a soil of a good quality, and compares favorably with what a good soil may be expected to contain in the essential elements of plant food—nitrogen and lime being good, phosphoric acid and potash moderate, and chlorine normal.

(Sgd.) P. RANKIN SCOTT,
Chemist for Agriculture.

The land was ploughed to a depth of 6 inches, and worked up to a good tilth with disc and spike-tooth harrows prior to planting. The seed was planted by hand between 12-19th October, 1914, during good weather conditions, the land being harrowed as soon as possible after planting. Subsequent cultivation with harrows, horse-hoe, and hiller were given as required, to keep the land clean and in a good state of tilth.

The season proved to be one of the driest on record. The average rainfall for this district during the months October to February inclusive is about 12 inches, but during the past season a good fall during the month of December was the only rain which did any material good to the crop; indeed, but for that timely fall the crop would probably not have been worth digging.

The prevailing weather during the growing period was an almost unbroken sequence of hot, dry days and nights. Hot winds following on what showers of rain fell caused very rapid evaporation, and made

Dipping Potato Seed, Leongatha.

the conditions, as far as moisture in the soil was concerned, very uncongenial for the crop, with the result that yields all through the tests were much lighter than was expected.

I.—IMMATURE AND RIPE SEED—MANURED AND NOT MANURED.

The two classes of seed used in this test was obtained from the same crop. The immature seed was secured before the crop had died down, selected and stored in seed potato boxes until planting time. The ripe seed was secured after the crop had died down, and treated in the manner commonly practised, viz., it was placed in a heap in a shed and covered with straw. Manurial and cultural treatments were in the case of both classes of seed exactly similar. The resulting crops showed a marked difference from their appearance through the ground to the harvesting, that grown from immature seed always being much more vigorous. The illustrations shown herewith bearing on this test were

obtained in January, about three months after planting. From these it will be seen that the crop grown from immature seed gave promise of better returns, and the accompanying tables show that the promise was fulfilled at harvest. In the sections manured, the manure used was—2 cwt. superphosphate, 1½ cwt. sulphate of potash, 1 cwt. sulphate of ammonia, and 1 cwt. Thomas phosphate. For simplicity of illustration, the value of the crop, large and small, is taken at £4 per ton, which is not far from the average price of this season.

Attention is drawn to the fact that in both cases, *i.e.*, manured and unmanured, the immature seed produced a greater percentage of marketable sized tubers, in addition to yielding a greater weight per acre than did ripe seed in either case, thus demonstrating the superiority of immature seed over ripe seed.

Class of Seed.	Large.	Small.	Total.	Value per acre at £4 per ton
	Yield per acre.			
	T. c. lbs.	T. c. lbs.	T. c. lbs.	£ s. d.
Immature manured	7 15 0	0 17 56	8 12 56	33 18 0
Immature, not manured	3 15 0	1 5 0	5 0 0	20 0 0
Increase due to manure	..	..	3 12 56	13 18 0
Cost of manure	£2 8 0 per acre			
Net return from use of manure ..	£11 10 0 per acre			
Ripe, manured	4 5 0	1 7 56	5 12 56	21 18 0
Ripe, not manured	2 2 56	1 5 0	3 7 56	13 10 0
Increase due to manure	..	..	2 5 0	9 0 0
Cost of manure	£2 8 0 per acre			
Net return from use of manure ..	£6 12 0 per acre			
Immature, manured	7 15 0	0 15 56	8 12 56	33 18 0
Ripe, manured	4 5 0	1 7 56	5 12 56	21 18 0
Increase due to immature seed ..	.	..	3 0 0	12 0 0
Immature, not manured	3 15 0	1 5 0	5 0 0	20 0 0
Ripe, not manured	2 2 56	1 5 0	3 7 56	13 10 0
Increase due to immature seed ..	..	..	1 12 56	6 10 0

II. and III.—Dipping and Spraying Test.

The object of this test was to get an estimate of the value of dipping seed and spraying the crop (1) for the prevention of disease, and (2) as a means of increasing the yield.

Two varieties of potatoes were used, viz., Sutton's Abundance and Factors. These were subjected to the various treatments of dipping and spraying, and were in each case planted without manures.

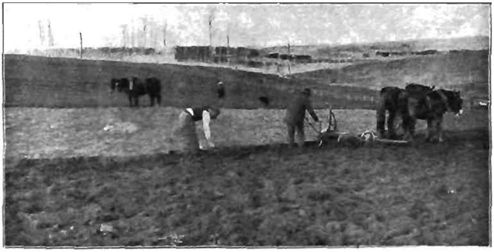
The dipped lots were immersed in a solution of corrosive sublimate (1 oz. to 6 gallons of water) for two hours. The sprayed lots were sprayed, on 20th January, with a solution of copper sulphate and washing soda, in the proportions of 2 lbs. copper sulphate, 2½ lbs. washing soda to 10 gallons of water.

The following weights were obtained from the different treatments:—

	Tons.	cwt.	lbs.
Factors, dipped only	4	10	0
Sutton's Abundance, dipped only	5	15	0
Factors, untreated	3	12	56
Sutton's Abundance, untreated	4	5	0
Factors, sprayed only	5	5	0
Sutton's Abundance, sprayed only	5	15	0
Factors, dipped and sprayed	4	17	56
Sutton's Abundance, dipped and sprayed	5	5	0

The tubers produced under all of these treatments were practically free from scab, except that caused by eel worm, which is not affected by dipping.

The dryness of the season was unfavorable for the development of blight, and the crop was free from damage from this cause. Owing to the fact that both treated and untreated lots produced clean tubers (excepting eel worm blister), no conclusions can be taken from this year's



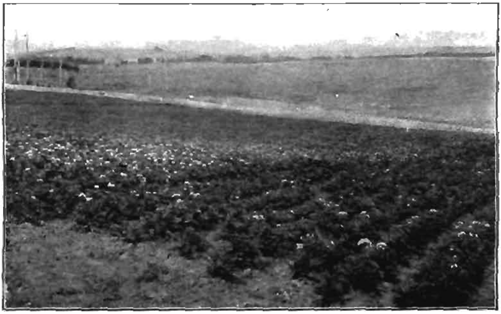
Planting Seed at Leongatha.

experiments as to the effectiveness of the dipping and spraying as disease preventives. It is worthy of mention that at the commencement of the season there was a marked difference in the growth of the plots in favour of the untreated seed, and yet, notwithstanding the fact that diseases caused no apparent damage, the yield from the untreated plot was exceeded by each of the three plots which were subjected to dipping only, spraying only, and dipping and spraying together.

IV. AND V.—MANURIAL AND VARIETY TESTS.

In this test the result of seventeen varieties grown under nine different manurial treatments were obtained. The dry season, as before mentioned, had a most harmful effect on the growth of these plots, and with that in mind, it is most interesting to find that the most liberal manuring still yielded the best results, judged both from the points of view of weight of crop returned per acre and that of profit resulting from capital expended on supplying manures.

In criticising the performances of the different varieties, it must be borne in mind that as seed for these plots had to be obtained from



Crops from Immature and Ripe Seed growing at Leongatha. Note stronger growth of Immature Seed in background.
Photo by courtesy of the *Australasian.*]

various sources last seeding season, the difference in the yields of different varieties is certainly not entirely due to the difference between these varieties as croppers, but is accounted for in large measure to the

Evidence in the Growing Crop of the benefit of using Immature Seed (on the left).
Photo by courtesy of the *Australasian.*]

treatment which the varieties have been subjected to in previous years. This may be more clearly expressed by saying that, in my opinion, it is

unfair to secure a number of varieties from a number of growers and judge their prolificacy on their performance during the first year of their being tested together, as there is bound to be a varying degree of virility in seed parcels so obtained, due to, amongst other things, the *treatment meted out to them in previous seasons and to their suitability* to their soil and climatic environment.

Next season's results from these varieties will be a much truer indication of their values as croppers.

The results from the manures, however, may be regarded as worthy of building on, as these are supported by the findings of many experiments.

The table of results is given hereunder:—

—	1* A.P.S.B.	2 A.P.S.	3 A.P.	4 A.	5 Nil.	6 P.S.B.	7 P.	8 S.B.	9 S.
	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.	T. c. lbs.
Factors	5 6 42	6 0 28	3 0 14	3 18 70	3 0 14	4 12 56	2 15 56	1 7 84	1 12 42
Beauty of Hebron	3 0 14	1 17 0	2 1 70	2 1 70	0 9 28	2 1 70	1 3 14	0 13 28	0 9 28
Vermont ..	5 15 70	4 7 98	2 10 98	1 12 42	1 17 0	4 12 56	2 1 70	1 3 14	1 3 14
Brown River ..	3 9 42	4 12 56	2 6 28	2 10 98	1 17 0	2 15 56	1 7 84	3 4 84	1 12 42
Breese's Prolific ..	*6 0 28*	*5 15 70*	*2 10 98*	*1 17 0*	*2 10 98*	*4 7 98*	*2 6 28*	*3 4 84*	*1 12 42*
Black Prince ..	5 15 70	4 12 56	4 3 28	2 15 56	1 3 14	3 4 24	2 15 56	2 6 28	2 6 28
Green Mountain ..	4 12 56	4 3 28	1 7 84	1 12 42	0 18 56	3 9 42	1 7 84	2 15 56	1 17 0
Brownell's Beauty	2 15 56	3 0 14	2 1 70	2 6 28	1 12 42	4 17 14	1 17 0	2 15 56	2 10 98
Peach Bloom ..	3 14 0	5 6 42	2 6 28	2 1 70	0 18 56	2 1 70	2 10 98	2 10 98	1 12 42
Gold Coin ..	3 18 70	2 15 56	3 9 42	2 6 28	1 3 14	4 7 98	4 12 56	3 18 70	4 3 28
Cleopatra ..	2 15 56	1 17 0	1 12 42	1 7 84	0 18 98	1 3 14	3 0 14	3 9 42	1 12 42
Queen Valley ..	5 6 42	3 18 70	1 12 42	1 17 0	1 17 0	2 15 56	3 0 14	1 17 0	1 7 84
Scruffle	4 3 28	2 6 28	1 3 14	1 7 84	1 3 14	2 1 70	1 3 14	1 12 42	1 7 84
Carman III. ..	5 11 0	4 3 28	4 7 98	3 14 0	2 1 40	2 10 98	4 7 98	2 10 98	4 3 28
Snowflake ..	3 14 0	1 17 0	1 3 14	1 7 84	0 18 56	1 7 84	2 1 70	1 3 14	1 3 14
Coronation ..	5 1 84	3 14 0	3 14 0	3 14 0	3 4 84	3 9 42	3 4 84	5 1 84	2 6 28
Scottish Triumph	2 15 56	2 15 56	2 6 28	2 10 98	1 7 84	2 10 98	1 17 0	2 1 70	1 3 14
Averages ..	**4 6 88**	**3 14 30**	**2 9 27**	**2 5 109**	**1 11 60**	**3 1 81**	**2 8 108**	**2 9 23**	**1 17 91**
Average increased weights due to manures ..	2 15 28	2 2 82	0 17 79	0 14 49	Check.	1 10 21	0 17 48	0 17 75	0 6 31
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Value of average of crops at £4 per ton	17 7 0	14 17 0	9 17 0	9 4 0	6 6 0	12 7 0	9 16 0	9 17 0	7 12 0
Average cash value increase per acre	11 1 0	8 11 0	3 11 0	2 18 0	..	6 1 0	3 10 0	3 11 0	1 6 0
Cost of manures per acre	**2 8 0**	**2 5 0**	**1 16 0**	**0 15 0**	..	**1 13 6**	**1 1 0**	**0 12 6**	**0 8 6**
Net average return from manuring	**8 13 0**	**6 13 0**	**1 15 0**	**2 3 0**	..	**4 8 6**	**2 9 0**	**2 18 6**	**0 17 6**
Approximate cost per ton increase of various manures ..	0 17 6	1 1 0	2 0 0	1 0 8	..	1 2 4	1 4 0	0 14 1	1 7 2

* *Rate of application of manures* :—A.—S. Ammonia, 1 cwt. per acre.; P.—S. Potash, 1½ cwt. per acre.; S.—Superphosphate, 2 cwt. per acre; B.—Thomas Phosphate, 1 cwt. per acre.

The result of the foregoing experiment has been reduced to a cash basis for the purpose of demonstrating the money value to the grower of liberal manuring. While it is not contended for one moment that the most profitable rate of mixing or of application of manures has been given in any one of these sections, it is contended that, notwithstanding the dryness of the season (a factor which, no doubt, operated against the manured sections more adversely than it did against the unmanured check plot) the liberal application of manures is a

decidedly profitable investment clearly demonstrated here. Much might be written of this, but the growers' study of it will be infinitely more profitable to him. Therefore, it is presented without further comment.

VI.—SEEDLINGS.

For the third season a number of varieties produced from seed presented by Dr. Wilson, of St. Andrew's University, Scotland, were tested. The results from these during the two previous years have been very gratifying. In October last these were planted side by side with local sorts at Leongatha, and again their performance has proved quite a number of them to be of such merit as to warrant their further cultivation. Fully thirty of these seedlings produced tubers at rates varying from 4 tons to 9 tons per acre under soil and seasonal conditions in which the best average of seventeen locally-grown sorts was 4 tons 6 cwt. The desirability of the further cultivation of these, therefore, is self-evident.

In conclusion it may be stated that the increased yields obtained from the use of immature seed and the application of liberal quantities of manure were anticipated, and these increased yields fully bear out the advantage of practices in the cultivation of the potato strongly advocated by this Department.

WHEN IS AN ORANGE RIPE?

This is a question which has vexed growers, dealers, consumers, legislators, and food commissioners for a long time. Immense capital is invested in the production of these fruits, and in course of time various abuses have arisen, and have become serious enough to receive much attention. Unscrupulous growers and dealers have sold unripe and immature fruit to unsuspecting buyers, and the practice of "sweating" green oranges to give them a yellow colour on the outside has been indulged in on a large scale. The reason why "sweating" is resorted to is that, apparently, ripe oranges can be sent into the market a few weeks ahead of time in the early part of the season, and those unscrupulous enough to resort to the practice gain an advantage of prices higher than is obtained by the honest grower who has waited for nature to bring her own work to perfection.

Orange growers in certain parts of America are protected by law against "sweating."

The various official attempts to see that the consumer got a good orange did not inform anybody how to tell an immature orange from a ripe one, and as soon as attempts were made to enforce the laws, it developed that there could be a wide difference of opinion as to when an orange was ripe. It was clear that colour was no guide, and as to taste—well, tastes are known to differ.

At length, after a prodigious amount of talk and study, those interested in the orange business have agreed that an orange to be considered ripe should not have more than 1.25 per cent. of acid, calculated as citric. In order to see that the law and the standard are lived up to, inspectors are put into the field, and go about taking samples.—[Extract from article in *Pure Products*, November, 1914.]

STANDARD TEST COWS.

Report for Quarter ending 31st March, 1915.

Considering the severe and protracted nature of the drought covering the period of this report, some diminution in milk yield was to be expected. Owners, particularly those in the northern districts, are undergoing an ordeal in providing substitutes for the natural herbage. Dear fodder is the rule when farmers buy, and the purchase of fodder at prevailing rates implies confidence in the capacity of the stock to which it is to be fed. Happily, this confidence is not lacking in the herd-owners in this test, and generally speaking, a genuine endeavour has been made to meet the season's deficiencies. Despite the high cost of foodstuffs, and the total absence of green feed, the yields generally might have been maintained more successfully had the complete ration been purchasable; but concentrate, without which no ration can be effective for a milking cow, has been either not procurable or procurable only in insufficient quantities. Where the whole of the food—both bulk and concentrate—had to be purchased under these circumstances, it is not surprising that the adverse conditions are reflected in the milk charts.

With regard to the southern districts, the position is more gratifying. Here, where the incidence of the drought was neither so early nor severe, some owners have been able to defeat its effect on the yields at least, by hand feeding. So successfully has this been practised that, in many instances, cows have surpassed their last year's excellent record. This, effected by auxiliary hand-feeding in a season like the present serves to emphasize the fact that pasture alone is not equal to sustaining the milk yield at the maximum, even in normal seasons.

Individual returns are as follow:—

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs	lbs.	lbs.
Graceful Duchess of Melrose VIII.	1,056	11.4.14	18.4.14	273	25½	8,765	5·77	505·72	250	576½
Jenny Lind VII. of Melrose	3650	15.4.14	22.4.14	273	23	7,877½	5·64	444·57	250	506¾
Jessie of Melrose VI.	Not yet allotted	27.4.14	4.6.14	273	21½	7,924½	6·71	532·17	250	606¾

F. J. STANSMORE, Pomborneit. (Ayrshire.)

Completed since last report, 15. Certificated, 0.

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Snowdrop of Springhurst	3709	8.4.14	15.4.14	273	9¼	3,613¾	5·25	189·68	175	216¼
Princess of Springhurst	2,521	16.4.14	23.4.14	273	7¼	6,291	5·87	369·11	250	420¾
Graceful Magnet of Springhurst	2,058	22.4.14	29.4.14	273	16	6,506½	5·21	338·98	250	386½
Tulip of Springhurst	2,730	23.5.14	30.5.14	273	8	6,099	5·93	361·57	250	412¼
Stockings of Springhurst	2,663	25.5.14	1.6.14	273	7½	6,119½	4·99	305·75	250	348½
Euroa of Springhurst	1,918	16.6.14	23.6.14	256	6	5,743	5·64	323·69	250	369

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dolenders Claribel . .	958	7.6.14	14.6.14	273	5½	5,660¼	5·70	322·80	250	368

D. SADLER, Camperdown. (Ayrshire.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Pearl of Kilmarnock	3,098	2.5.14	9.5.14	273	10	4,951¼	4·59	227·51	175	259½
Sunflower of Kilmarnock	3,100	13.5.14	20.5.14	273	5	5,479	4·84	265·42	175	302½
Get of Kilmarnock	3,092	16.5.14	23.5.14	273	17	6,643	4·12	273·49	175	311¾
Brilliant of Kilmarnock	3,090	17.5.14	24.5.14	273	4	5,338½	4·68	249·75	175	284¾
Spider of Kilmarnock	3,099	21.5.14	28.5.14	273	5	3,924¾	4·58	179·76	175	205

THE HORSE'S FOOT AND ITS CARE.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer, Department of Agriculture.

The subject, "The Horse's Foot and its Care," is of great interest and importance to all, for there is hardly a horse-owner in the country who will not agree that the foot is perhaps the most important part of the horse.

Some will not admit this without including the leg; but, as will be seen at a later stage, the legs depend to a considerable extent upon the character of the foot. However, that the animal's usefulness is dependent upon the possession of good feet has long been recognised. Even in colt-hood the feet, if neglected, may become a source of trouble. Many a fine-grown youngster has lost a place in the show ring because of crooked legs, and the majority of these are contracted from neglected feet.

Before entering into this aspect of the subject, it is necessary that we should know something about the structure of the foot in order that a reason may be assigned to our methods, and that we may fully appreciate the importance of such methods.

The first of the structures which we must consider is the bony skeleton of the limbs, and we will take a fore as an example, avoiding as much as possible all minute anatomical details and scientific technical terms.

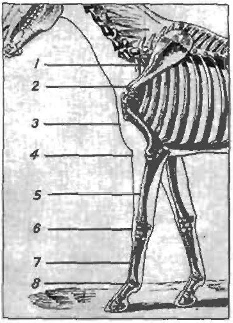


Fig. 1.—(1) Shoulder blade.
(2) Shoulder joint.
(3) Humerus.
(4) Elbow joint.
(5) Forearm.
(6) Knee.
(7) Cannon.
(8) Fetlock.

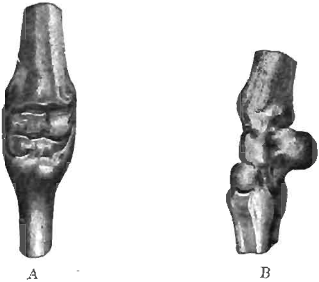
The bones of the foreleg (Fig. 1) commencing at the superior aspect, are:—First, the shoulder-blade, bound firmly to the body wall and capable of very little lateral movement. The shoulder joint is formed by the union of this bone with the next below (the humerus). The joint is of a ball and socket variety—that is, the movement of it is in any direction. The lower end of this bone forms, with the heads of the bones of the forearm (the radius and ulna), the elbow joint. The study of this joint (Figs. 1 and 2) will show that the movement is in a backward and forward direction only—that is, it is like a hinge. There is no side movement. The lower end of the forearm forms, with several small bones of the knee proper, the knee joint (Fig. 3), and here again it will be seen that there is practically no outward or inward movement, but the same hinge-like one as present in the elbow.

We come next (Fig. 4) to the cannon bones—1 large, and 2 small, *meta-carpals, extending downwards, and forming, with the long* pastern bone below (the os suffraginis), the fetlock joint. The lower end of this, in conjunction with the short pastern bone (the os coronæ), forms the pastern joint, and this in joining with the coffin bone (os pedis), along with the navicular bone behind, forms the coffin joint. The movement of these three joints is purely a hinged one in a backward and forward direction.

Fig. 2.—Ligaments of the Elbow Joint—posterior view.

A close knowledge of these structures, and particularly of the movements in them, is, as will be seen later, most important to a clear understanding of why it is necessary to take care of the foot.

Passing now to a consideration of the foot itself, there are numerous structures entering into its formation, and, for convenience, we take them from the visible part—the hoof—to the invisible—the bony skeleton. The hoof is divided into the horny crust or wall, the sole, and frog or foot pad. (Fig. 5.) The wall is divided for *convenience into toe, quarters, and heels,* at which point it is turned sharply inwards to form the bars; towards the heels the thickness of the wall decreases. This, together with the inflection of the bars, provides a springlike mechanism; the bars also serve the purpose of binding the sole and



A B

Fig. 3 (A).—The knee joint front view.
(B) Side view showing ligaments binding the bones, allowing for backward and forward movement and preventing lateral movement.

wall together. They act as buttresses, preventing the shrinking of the heels; if they are cut away, the heels contract and a narrow foot results. They must, however, have some other function, else it would answer *the purpose if the wall were continuous around the whole foot.* If

such were the case there would, of course, be no spring in the heels, for they would be incapable of expansion. The main reason, then, for this break in the continuity is *to provide a circle of horn* capable of opening outwards at the heel (Fig. 6), and this it will be seen, occurs when weight is placed upon the foot.

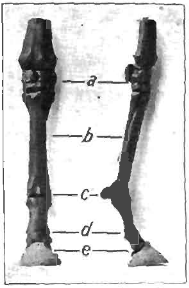


Fig. 4.—Bones of a Fore Leg, front and side view, showing provision for *backward and forward movement only.* (*a*) Knee joint, (*b*) Cannon bones, (*c*) Fetlock joint, (*d*) Pastern joint, (*e*) Coffin joint.

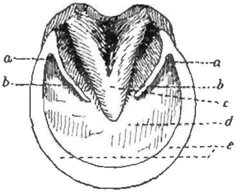


Fig. 5.—Ground Surface of Foot. (*a*) Heels, (*b*) The Bars, (*c*) The Frog, (*d*) The Sole, (*e*) The Wall.

The structure of the wall is fibrous, the fibres running parallel to each other, and with the same obliquity as that presented by the front

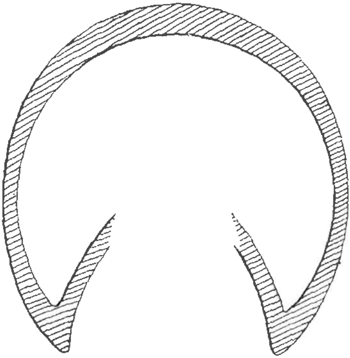


Fig. 6. Transverse section of wall showing bars with frog and sole removed

of the wall. The fibres may be likened to a number of hairs cemented together, which are secreted by small projections found on the coronary

band, which lodges in the groove along the top of the wall. (Fig. 7.) Although the wall varies in thickness from the front to the heels, it does not do so from above downwards. The thickness of the coronet

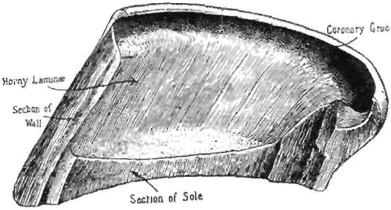


Fig. 7.—Half of a hoof showing the inside.

is the same as at the ground surface. Although apparently a hard, dry structure, a considerable amount of moisture is present in the horn, more particularly in the deeper parts, which is very necessary in maintaining elasticity. Covering the surface of the wall is a thin layer,

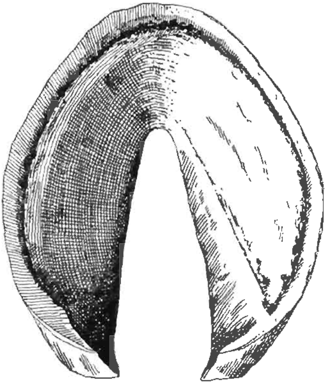


Fig. 8.—The sole with frog removed.

known as the "periople," which resembles a coat of varnish, and its use is to prevent rapid evaporation of moisture, which leads to dry, brittle feet. On this account, it should never be interfered with by

rasping the outside of the hoof. Too much moisture in the horn by standing in wet stalls, &c., is also injurious, leading to various diseases.

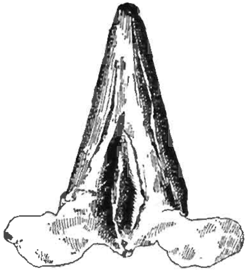


Fig. 9.—The frog detached from the sole.

Upon the inside of the wall is found a large number of thin, long, horny leaves (horny laminæ), running from above downwards. There are from 500 to 600 of these, and their functions will be more carefully studied when dealing with the sensitive foot.

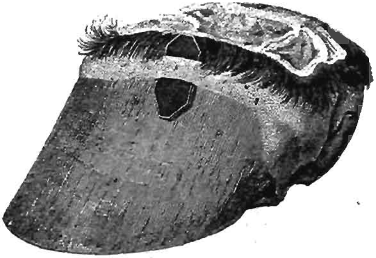


Fig. 10.—The frog band detached from wall by small wedge

The sole is the thin layer of horn forming the floor of the foot (Fig. 8), situate within the lower border of the wall. It is slightly arched, so that its centre does not come in contact with the ground. Posteriorly it is divided by a triangular space, into which the frog

fits. Its inner surface is covered with small pits, which correspond to projections on the sensitive part beneath.

The frog is a peculiar structure of horn, triangular in shape (Fig. 9), and, though situated between the bars, it is only attached at its upper border, leaving a space below which allows for expansion without the pressure being distributed to the whole foot. Under natural conditions the frog is full and large, with considerable elasticity; the bulbs plump and rounded. Too often in the foot of animals that have been shod it is found small and dry and shrivelled. I am glad to say the condition is not nearly so common as it was some years ago, for smiths have learnt that nature intended it to bear on the ground, and not be cut away. It is peculiar that the more wear it gets the better it develops. As will be seen later, it has an important function to perform, due to its elasticity and capability of undergoing compression. Covering the bulbs of the heels there is a thin layer of light-coloured horn, which extends round the upper portion of the wall, and which stands out visibly after the foot has been poulticed. This is known as the "frog-band." (Fig. 10.)

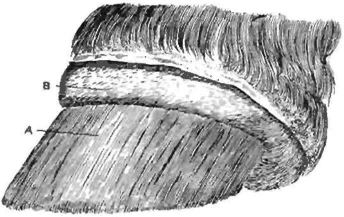


Fig. 11.—Foot with hoof removed showing (A) sensitive laminæ, (B) coronary band.

All that has been described so far is known as the "insensitive" foot. We now come to the structures beneath, known as the "sensitive" foot.

Corresponding to the horny laminæ, we have, covering the wall of the sensitive foot, the same number of delicate leaves, the sensitive laminæ (Fig. 11) between which the horny laminæ dovetail, forming a very close union between the wall and sensitive foot. This assists in supporting the weight of the body, for to a certain extent it may be said that the foot is slung in these laminæ. They are attached by dense tissue to the bones and structure below them, and are plentifully supplied with nerves and blood vessels.

Along the superior border of the sensitive foot, at its junction with the skin, is found a dense band of tissue, the coronary band (Fig. 11), which corresponds to and fits into the groove, already mentioned on the wall. On its surface are numerous projections or papillæ, which fit into depressions in the wall. It is from these papillæ that the horn fibre

grows, whilst the spaces between form the cement substance which connect them all together. It is essential that no injury should be done to this coronary band, for upon its healthy condition depends the soundness of the wall.

The sensitive sole is that portion to which the sole is attached. Its surface is covered with papillæ, from which the horny sole is secreted; *it is an exact counterpart of the sole.* The sensitive frog is an exact reproduction of the frog, with its cleft and commisures at each side. Except at its point it is not attached to the coffin bone, but to a pad of tissue known as the "Plantar Cushion," or "Frog Pad." It fills up the space between the sensitive frog, the lateral cartilage and the bone. As will be seen later, it is an important part of the foot.

Extending in a backward direction from the wings of the coffin bone, to which they are attached, are found thin plates of cartilage known as *the lateral cartilages. They extend above the level of the coronary* band, and, as has been pointed out on other occasions, are the structures involved in the formation of sidebones. These cartilages form the basis of the back part of the foot, upon which the wall is moulded. They are covered on the outside by sensitive laminæ, and, being elastic, permit of certain movements in the posterior of the foot. If the whole of the hoof *were filled with the coffin bone, there would be a hard unyielding, rigid* foot, subject to jar and concussion.

We may now turn to a consideration of the uses of these structures. First, of course, the dense covering is for protection, to prevent injury and bruising of the parts beneath; but if this were the only use, then a complete simple and dense box would answer the purpose. As has been seen, the parts are peculiar in shape and structure, and all go to form, as a matter of fact, a yielding or springlike termination to the leg. *No one part of the foot is of greater importance than another.* Each is dependent for its soundest condition upon its neighbouring parts, the whole producing sufficient yielding to overcome concussions when the foot comes to the ground. When the foot does come to the ground the following phenomena occur:—The frog, coming in contact with the ground, presses upon the sensitive frog beneath, and this is transmitted in turn to the plantar cushion. The squeezing causes an outward bulge, for at the same time there is a slight descent of the coffin bone, through the coffin joint yielding backwards. This causes a pressing outwards of the lateral cartilages, which, in turn, expand the heels. The whole amount of give is small, but is just sufficient to arrest jarring, and may be likened to the hand giving backwards when catching a ball without inconvenience. *If the hand is kept still the concussion is great, and may injure the joints, &c.*

That the foot is capable of expansion has been demonstrated frequently by a simple method. A sheet of paper is placed on a flat surface, such as a board. The foot is then placed on this, and close around the wall a pencil is drawn, giving an outline of the hoof. Then the opposite leg is lifted, and again a pencil outline is made. It is then found that when the whole weight is borne by one leg the hoof at the heels has expanded slightly. This is allowed by virtue of its springing character and the bars already referred to. In order to maintain this characteristic it is necessary that the horn shall contain a certain amount

of moisture, and the walls shall come in contact with the ground; also that the frog shall be fully developed. At the same time, there is a slight descent of the coffin bone and a flattening of the sole.

Let us now pass to a consideration of the necessity for care of the feet. Under natural conditions, and in its wild state, the growth of the

Fig. 12.—Showing overgrowth of horn from want of friction.

feet was to a large extent automatically controlled by wear and tear; but under domestication it is found that by leaving them alone they either overgrow, owing to want of friction (which they do not get on soft ground) (Fig. 12), or by excessive wearing on hard ground produce soreness. This latter condition is overcome by shoeing; but it should be borne in mind that the foot is continually growing, and consequently at periodic intervals friction must be supplied by the farrier's rasp to take the place of natural wear and tear, and so keep the hoof within reasonable limits of growth. I will deal with the question of shoeing at a later stage.

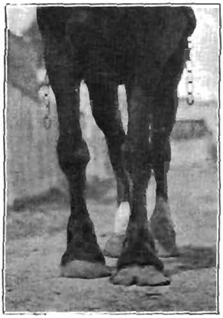


Fig. 13.—Showing Irregular Feet, causing "off" fore to turn in and "near" to turn out.

Taking the conditions prevalent on most farms, we know it is necessary to trim the feet frequently. Unfortunately, this is not done often enough, and it is a common thing to see feet of all shapes and sizes, and frequently with large portions breaking away from the walls, or split, sometimes almost to the coronet. (Fig. 13.)

Excessive growth of horn causes disproportion in the foot, and ill-formed feet react injuriously upon the limbs, producing various distortions. The horn, growing as it does, in a forward direction, tends eventually to become too long at the toe, and the centre, upon which the weight is carried, is too far forward from the vertical line of the leg. Overgrowth of wall also tends to lift the frog from the ground, and from disuse this wastes, and contracted feet occur. (Fig. 14.) Portions of the wall breaking away or being removed unevenly cause a twisting

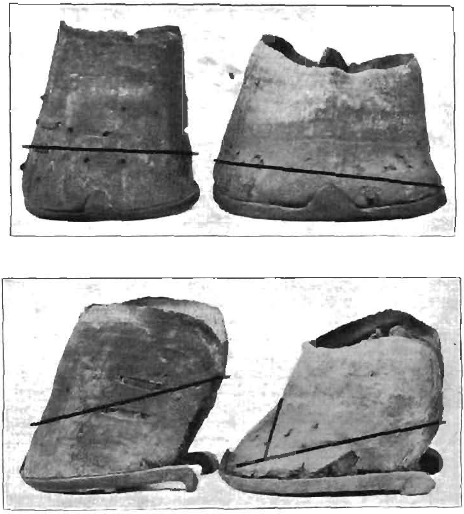


Fig. 14.—Irregular and overgrowth of horn, the black lines show approximately where the hoof should be cut away to.

of the legs and distortion, which in young animals is a serious condition, as the bones tend to grow in this form.

In trimming the foot, certain points should always be borne in mind. The angle at which the wall meets the ground varies in different feet, but, as a general rule, it should approximate 50 degrees in the fore feet. (Fig. 15.) If much less the toe is too long; if much more the heels are too high. The bearing surface of the foot, *i.e.*, that part in contact with the ground—should be level. First, so far as the actual surface is

concerned, there should be no excessive reduction at heels or toe. But an even more important feature is that, when looked at from the front, both sides of the wall should be of equal height, thus making a line through the coronet run parallel to the ground surface, and a line to the centre of the limb cut these at right angles. (Fig. 16.)

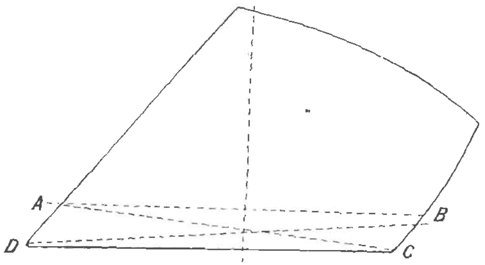


Fig. 15.—Showing correct reduction along line A-B; if along D-B, toe is too long; and if along A-C, heels are too high.

Under such circumstances the foot is properly balanced. If this condition is not present, then the horse is to suffer. If either wall is allowed to be too long the coronet will not be parallel to the ground. This will tend to throw the pastern bones outwards from the vertical line. (Fig. 17.)

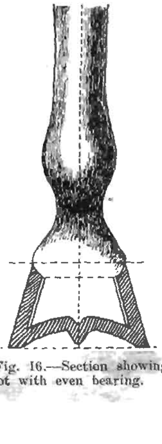


Fig. 16.—Section showing foot with even bearing.

As already explained, the joints of the limb can only move in one direction; consequently the leg has to be twisted to allow them to work. This twisting is carried on as far as the shoulder—the only joint capable of counteracting it by its ball and socket action—and if the inside wall is the higher we find the animal with turned-in toes, knees wide, elbows turned out. (Fig. 18.) If the animal is young and growing, this all tends to produce bent bones or crooked legs in an outward direction. A far worse fault, however, is to allow overgrowth of hoof on the outside. When the reverse to this picture is presented (Fig. 19) toes turned out, fetlocks close together, knock-kneed, elbow turned in, pinching the chest—these horses will always be found brushers (Figs. 20, 21), and apart from this, are frequently lame from the strain upon the feet and joints.

Fig. 17.—Showing pastern bones thrown out of perpendicular by artificial raising of outside of hoof.

for there is not the same chance of adjustment of the limb as with the pigeon-toes.

In order to produce the straight action so dear to the heart of all horse lovers, it is essential that all the joints of the leg *should bend in a direct forward direction*: but this can only be obtained by the horse breaking over the foot at the centre of the toe, any change of point, for so breaking over means that the leg is screwed to enable the joints to bend, and the result is a throwing of the leg from the straight line, and crooked action results. (Fig. 22.) The reaction of the *limb to distorted forms of hoof is* more serious in the young with growing bones than in the aged with mature tissues, and advantage may be taken of this knowledge to correct defective limbs by altering the vertical line of bones. Thus knock-knees may be corrected by allowing overgrowth inside. A colt with well-forward limbs requires only that his feet should be kept proportionate.

Hocks turned excessively inwards may be counteracted by allowing overgrowth on inside, or *vice versâ*. If overgrowth cannot be provided for, then shoes of suitable thickness may be made.

Fig. 18.—Effect of badly balanced feet—toes in, knees and elbows out, wide chest.

In dressing the feet no cutting of the sole or frog is required, as shown in Fig. 23; nature provides for the shedding of superfluous horn All that is required is to lower the wall in the manner already indicated, so that it is level, and the frog is not lifted from the ground (Fig. 24.)

Before concluding, a few words on shoeing will not be out of place. It has frequently been stated that shoeing is a necessary evil; but if

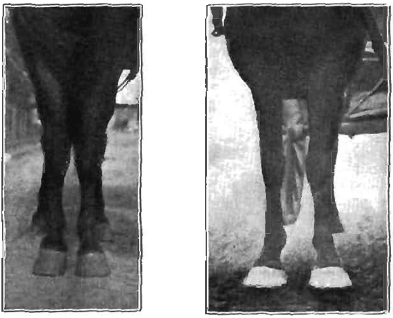


Fig. 19.—Effect of badly balanced feet—toes out, knees and elbows in, pinched chest.

shoes are intelligently made and applied there is no evil in the practice. That evil results do occur is not due to the practice, but to ignorance of the fundamental principles. It should be borne in mind that a shoe under normal conditions is only applied to prevent excessive wear of the wall, and consequent injury and bruising of the sole; therefore it should be as light as possible. A heavy shoe does not always mean a long lasting one, for the iron may be so distributed as to wear quickly. The weight is judged by the amount and class of work required. Further, a heavy shoe requires more nails than a light one, and an excess of nails should be avoided, for they injure the wall and aid evaporation of moisture.

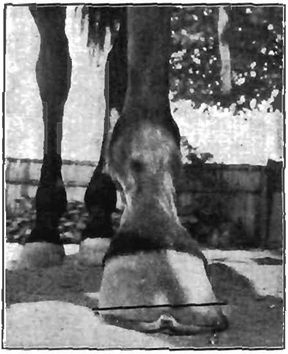


Fig. 20.—Foot of a Brusher. The black line indicates the direction the ground bearing should occupy; so much of the inside wall has been removed that several shoeings would be necessary before the foot could be brought to the correct shape.

So far as width is concerned, no "cover" for the sole is required under normal circumstances. Defective soles may sometimes require

protection, therefore a shoe should be as wide as the natural bearing surface; wider does no harm until it is sufficient to afford lodgment *for stones between it and the sole.*

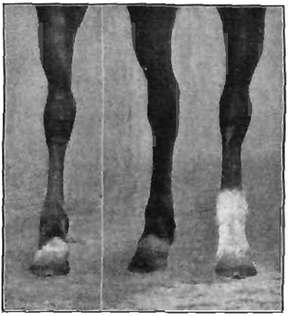


Fig. 21.—Hind legs of brusher toes too much turned out from overgrowth of outside wall.

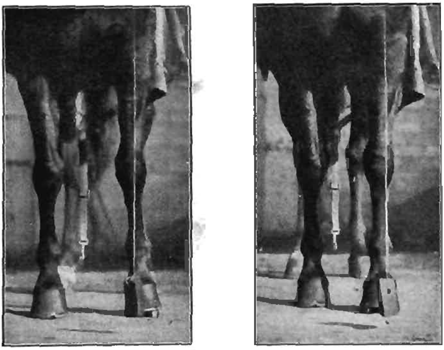


Fig. 22.—Showing how perpendicular of leg can be artificially altered by raising in or outside.

With reference to thickness: If too thick the foot is raised from the ground, and contracted feet result, and the direction of the nail holes becomes harder to control, with the result that injuries may accrue.

The heels and toes should be of the same thickness, so as to preserve a level bearing. Excessive thickness at the toe causes a strain on back tendons, and at the heels tends to straighten the pastern. If calkins are used, then toe pieces must also be put on, and they must be as low as possible. Seldom, indeed, are they necessary, for if the frog is allowed to grow properly and be in contact with the ground slipping cannot take place.

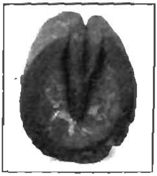


Fig. 23. — Contracted Foot, frog and bars cut away.

Fig. 24.—Open Foot, well developed frog.

Fig. 25.—Neatly Trimmed Feet.

The best form of foot surface to a shoe is perfectly level throughout. At times it is necessary to slightly "seat" the shoes along the inside when there is a tendency to flat sole, for the sole must not carry weight except at its junction with the wall. In any case the seating should not be carried all the way round, but the heels should remain flat to provide for bearing on the bars.

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 246.)

MANURING AND ROTATION CROPPING.

A 50-bushel crop of maize per acre is said to require for its development the following amounts of the three most essential plant foods:—

74 lbs. nitrogen,
26.3 lbs. phosphoric acid,
42.6 lbs. potassium.

Except under extraordinary conditions such as prevail on the Snowy and Tambo rivers, where the soil is annually supplied with fresh materials by siltation, some system of manuring is necessary to encourage the maximum yield of maize, and at the same time keep up the standard of fertility in the soil. To keep on taking from the land the required elements for plant growth, and so reduce in time the possibility of the land yielding a full crop, and at the same moment impoverishing the soil for other purposes, is a mistaken business policy. A rich soil should be kept rich, and a poor soil can be improved by sensible treatment or rendered useless by bad usage. Moreover, systems for the maintenance of land can be made highly profitable as they are employed.

NITROGEN.

Taking the most important plant foods in order, we find that nitrogen is taken by maize in larger quantity than any other cereal and the effect of this particular food is chiefly to build up the leaf and stem of the crop. When we realize that through the leaf system 95 per cent. of the crop's nutrition is absorbed from the atmosphere, we can readily understand how important a sufficient supply of available nitrogen is in providing a leaf surface area capable of taking in enough carbon dioxide from the air to fully develop a crop.

Nitrogen can be supplied in several ways—through good and early cultivation, as already suggested; by rotation cropping; and by the use of fertilizers in the form of nitrate of soda, sulphate of ammonia, and blood manures. These latter are all expensive, and can be avoided by cultivation and rotation cropping.

Where the rainfall is abundant a green fallow crop can be grown, in the shape of rye and vetches, sown in the autumn, in time to give it a start before the winter, at the rate of 1 bushel of rye and 6 to 10 lbs. of golden vetch. This crop can be fed off during the winter months, and will fatten eight to ten sheep or more per acre, according to the amount of growth made, and then turned under in the spring, a month or six weeks before the maize is planted. The effect of such a crop treated in the way mentioned is to supply nitrogen in sufficient amount for at least a 50-bushel maize yield; also to restore humus to the soil through the root matter, which, from rye especially, is considerably greater in quantity than from any other cereal. Other crops,

viz., red clover, peas, and rape, are also very good; red clover, however, requires a summer to mature its full value both as fodder and residual effect.

Where the rainfall is less in amount and the soils poorer, the rotation should be used in alternate years with maize, and better results will ensue.

As a general rule, rye and vetches prefer sandy loams, and red clover clay loam. These crops have a useful effect, too, in releasing some of the locked-up phosphoric acid and rendering it available for the maize that comes after. If, however, it is intended to use a nitrogenous fertilizer to supply the whole amount required, nitrate of soda, applied after the crop comes up, at the rate of 500 lbs. per acre, would be necessary; sulphate of ammonia, 400 lbs. per acre, which should be applied just before the seed is sown; blood manure, 700 lbs. per acre, applied well before the seed is sown.

It must be remembered that the natural supply in the soil should be available for at least half the nitrogen wanted by the crops, so 50 per cent. of the quantities quoted above should suffice.

PHOSPHORIC ACID.

This constituent of plant growth cannot be obtained from the atmosphere, as is the case with nitrogen, but is contained in the soil in varying quantities, mostly in an unavailable condition, gradually becoming of use through chemical and other agencies, but as a rule too slowly to keep pace with constant cropping requirements. Therefore, unless fresh supplies are applied, it is only a matter of time when the crop demands will be unsatisfied and low yields result. The quantity taken per acre by a 50-bushel maize crop is small as compared with other cereals, a 50-bushel crop of wheat, for instance, taking nearly twice the amount that maize does. Still, to keep a soil from deterioration under maize culture, no less than ¾ cwt. to 1½ cwt. should be applied.

There are several phosphatic fertilizers on the market containing this ingredient, viz., superphosphate, Thomas phosphate, and bonedust. The former is the most popular and is best used on soils containing a good natural or artificial supply of lime. Its effect is to stimulate root growth in the early stages, and later to fully develop the grain. Thomas phosphate contains more free lime than superphosphate, and is heavier and finer ground in comparison to bulk. It is eminently suited to cold clay soils and those inclined to be sour. It is slower in availability, and should the first year be used in larger quantity.

Thomas and super. are sometimes mixed, but care must be taken in the quantities used, at least two parts of super. to one of Thomas being necessary to insure good results. Bonedust is slower than superphosphate in effect, but is of special value in sandy soils and soils containing large amounts of organic matter. All phosphatic fertilizers can be applied, when the seed is sown or just before, with advantage.

POTASH.

Victorian soils generally contain potash in large quantity, and soils adapted to maize culture especially so. As a fertilizer this class of manure is not largely used at present.

There are several kinds on the market, viz., sulphate of potash, the best form to use for most purposes, having a better effect on the quality of grain, fruit, potatoes, &c., than the others. "Muriate of potash," sometimes known as chloride, is often used for maize, with good effect. "Kainit" is a lower form, chiefly useful for mangels, containing too much chlorine for soils already holding too much of that particular salt. Potash fertilizers can be applied when the seed is sown, in quantities of from ½ cwt. to 1 cwt. per acre.

LIME.

Lime, though not taken in great amounts by maize (12 lbs. per acre for a 50-bushel crop), is highly necessary in the land, for various reasons.

It has a useful mechanical action in making more friable a clay soil and consolidating a loose, sandy soil.

It releases potash and increases nitrification.

It renders the soil more wholesome, neutralizing acidity.

It reduces insect pest and diseases.

All soils deficient in lime will be benefited by applications of from 5 cwt. to 1 ton per acre every five or six years.

It should be applied in the autumn on the ploughed land and harrowed in. It is a mistake to plough lime under, as its natural tendency is to sink, being a heavy substance.

No seed should be sown until at least a month after the lime has been put on.

There are three kinds of lime on the market—

Burned lime,
Ground limestone,
Gypsum (sulphate of lime).

Burnt lime is best suited to raw, peaty soils or very sour soils. It should be slaked by emptying the bags over the paddock already ploughed and covered with a few inches of soil. It will then become slaked, and can be distributed through the spreader or by other means.

Ground limestone is applied to all soils requiring lime, and need not be slaked. It should be used in about twice the quantity per acre as compared with burnt lime.

Gypsum is specially applicable to salty soils, does not want slaking, but three times as much is required per acre as burnt lime.

At Ohio station, *vide* Ohio Agricultural Experiment Station, Bulletin 159, the addition of lime increased the yield of maize 10 bushels per acre, or 30 per cent., used both with and without manures, and that at lower cost than for manures only.

FARM MANURE.

Farm manure is of great value for maize in supplying humus, as well as food, but unfortunately is not available in any great quantity in this State, owing to the fact that our stock are not stall fed, but run in the open paddocks. Where it is possible to obtain usable amounts it should be applied in the autumn, at the rate of from 30 to 70 loads per acre. When used on sandy, loose soil it is best put on in a well-rotted state, which will have the effect of enabling such soils to retain moisture better. For stiffer clay land, undecomposed

manure, ploughed in with straw and litter, will leave the land more porous and friable as the straw and rough vegetable matter rots. Farm manure provides humus for the soil, which the mineral fertilizers cannot do, and in this lies its special value. The ploughing in of green crops will, to some extent, fill this want; and if the fodder crops in rotation are allowed to grow up to 10 or 12 inches in the early spring, and are then turned under, considerable benefit in this respect will be felt, especially in sandy soils.

SELECTING SEED.

Probably the greatest improvement in respect to average yield and suitability to local conditions can be brought about by a judicious method of seed selection. We apply this rule to all other crops and to animal breeding, and yet neglect to take advantage of the opportunities in regard to maize improvement. The few growers who have adopted selective tactics have in some cases not gone far enough, and have based their operations more on the broad system than on the narrow. To select from the best cobs in the sack or bin is not sufficient, and is liable to lead to wrong results in many cases. Mr. James, of Orbost, one of our most advanced growers, believes that careful selection on the most approved lines will do more to the establishment of the best kinds of maize to grow in new districts with the most profitable results than any other process. To achieve this end, growers must rely on their own efforts and select for themselves in each locality the various qualities required to suit each different district.

By broad selection is meant the choosing of ears or cobs from the bulk crop. By narrow selection, the choosing of ears on individual stalks in the field The difference between the two methods in practice is shown by experiments carried out by Mr. C. G. Williams, Ohio Experiment Station, U.S.A., 1906-07:—

PLANT SELECTION v. ORDINARY SELECTION.

	Bushels.
Average yield per acre of 4 plant-selection plots	72·49
Average yield per acre of 4 ordinary-selection plots	69·26
Average gain for plant-selection	3·23
Average yield per acre of 4 plant-selection plots	89·04
Average yield per acre of 4 ordinary-selection plots	84·64
Average gain for plant-selection	4·40
Average yield per acre of 4 plant-selection plots	80·76
Average yield per acre of 4 ordinary-selection plots	76·95
	3·81

In practice on a large scale these figures have been improved upon, and Mr. James and others state it is possible and likely that if selection was generally followed on right lines, the average yield could be increased easily 10 bushels per acre, and it is the extra yield, over and above the cost of production, that pays. The time and expense spent in selecting seed would be a mere bagatelle as compared with

Well-formed Grains of Maize showing Good Germ.

Showing Square Edges of the Well-formed Grain.

Badly-formed Grains.

the profits for one year. The effect, however, is felt for several years, and if the selective system is persevered in, it will lead to still further success as time goes on.

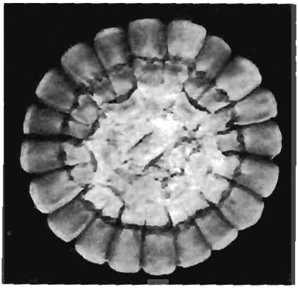
Seed should be selected for its—

1. Trueness to type.
2. Adaptability to climate and other circumstances.
3. Uniformity.
4. Proportion of grain to cob.
5. Height of stalk and of ears.
6. Angle of the ear on the stalk.
7. Shape and weight of the ear, and number of ears.
8. Freedom from disease and general strength of plant.
9. The state of the husk.
10. Manner in which tips and butts are filled.
11. Space between rows of grain.
12. Shape of grain, and colour.

Types vary, and the selector should make himself conversant with the requisite qualities in the special types that he is handling. If possible, it is a good plan to get a few ears of whatever type is desired and make them the basis on which to select, having in mind colour,

A well-filled Butt of Maize.

shape of ears and grain, space between rows, and general appearance. Maize is self-fertilizing, and after a few years tends to fix its type when not affected by hybridization from other varieties, a system of selection greatly accelerating this desirable result.



A well-packed Ear, showing no Waste Space.

In choosing for adaptability, local considerations must bear a large part. The length of season, ordinary periods of summer rainfall, suitability of soil, are possibly the most important points to observe. There are others, however, that should be attended to, such

as the ability of the stalk to stand up under certain conditions of rainfall and wind. Proof is not wanting that such qualities are hereditary, and ears should not be selected from stalks that go down naturally. Another and important matter lies in the height of the ear or ears on the stalk; these can be too high or too low. Generally speaking, 4 ft. 6 in. is a useful height for the first ear, though some growers prefer a lesser height. Where floods are likely to occur during the ripening season, as is the case in some localities, it is best to aim at a sufficient height to avoid trouble in this respect, as submerging the cob causes mildew, and disease destroys the bright colour. Too high an ear makes more labour in picking, and causes greater leverage on the plant inclined to go down.

It is found that maize ripens somewhat unevenly, and, in selecting for length of ripening period, attention must be paid to those stalks which mature the ear at the right stage to suit the average season. Much also depends on the nature of the soil and closeness of the plants as to the influence on individual stalks and ears. An isolated plant

An Ear well filled to the top.

in the field which has more available space than the majority may develop one or more ears well, while if the same plant had enjoyed only the same privileges as the remainder of the crop, its product might have been below the average. Such plants should be avoided in selecting seed, and only those grown under normal conditions taken. The judgment of the grower is largely called into play here in regard to the capability of his soil, as it is found that the best returns are made on some soils where only one plant per hill, bearing one ear, will yield best; on other soils, three plants per hill, carrying from one to two, or even three, ears, give best results. In the former case the soil is of low quality, or has a poor moisture-holding capacity; in the latter the reverse obtains. To grow more stalks than is necessary to produce the maximum quantity of grain is an error, which merely taxes the land unduly, and to no useful purpose. Uniformity is highly necessary, and in observing the proportionate length of the ear to its

diameter, colour, shape of grain, and size, and selecting with the object of getting uniform seed for future use, a more attractive sample of maize is produced, truer to type and of greater value.

The proportion of grain to cob is extremely variable. A good ear should be 75 per cent. grain, some maize exceeding this proportion, reaching 85 per cent., and when we realize that in other cases the proportions are reversed, we see why it is that some cribs of maize yield so much more than their neighbours. The number of rows of grain do not affect this question to the same extent as the shape, depth, and solid packing of the grain. The shape of the ear, too, is of consequence, and this should be cylindrical, measuring in circumference about three-fourths of the length. Ears heavy to the feel are generally well filled, and it is very evident here, where the value of selection applies. A good, well-filled ear will have the grain wedge-shaped, deep, square on the top, with the smallest possible space between the rows.

The open, badly-packed ear admits moisture, disease, and insects, and, in addition to yielding a bad sample of grain, is light in weight.

(To be continued.)

HINTS TO SETTLERS.

AN EIGHT-BAIL MILKING SHED, CHAFF-HOUSE, AND IMPLEMENT SHED.

By J. Wilson.

The accompanying illustrations are for an eight-bail milking shed, chaff-house, and implement shed.

QUANTITIES.

At present price of material in Melbourne, it would cost £64 landed on trucks at Spencer-street Station.

SPECIFICATIONS.

The bottom plates of 4-inch by 2-inch hardwood are set on stumps of 4-inch by 4-inch redgum spaced about 4 feet between, and sunk in ground 2 feet. Top plates of 4 inch by 2 inch, except at front of milking shed and outer plate of implement shed. The front plate, 4-inch by 3-inch, of milking shed is carried on 4-inch by 4-inch hardwood posts tarred at bottom and sunk 2 feet in ground. On top of each of these intermediate posts is fixed a short plate of 4-inch by 3-inch hardwood, 4 feet long, to prevent the main plate from sagging. The outer plate of implement shed is 6-inch by 2-inch hardwood, carried by a 4-inch by 4-inch hardwood post at the centre, checked out 6 inches by 2 inches to receive top plate, and tarred at bottom and sunk 2 feet in ground. Angle studs of 4-inch by 4-inch hardwood, and all other studs 4-inch by 1½-inch hardwood, spaced about 18 inches centres, and let into plates ⅜-inch, and

well spiked with 3-inch nails. Walls to be well braced and sunk in flush (braces 3-inch by 1-inch hardwood), and covered externally with weatherboards, showing a 5½-inch weather to each board; fix angle stops of 3-inch by 1½-inch at each corner. Rafters, 4-inch by 2-inch hard-

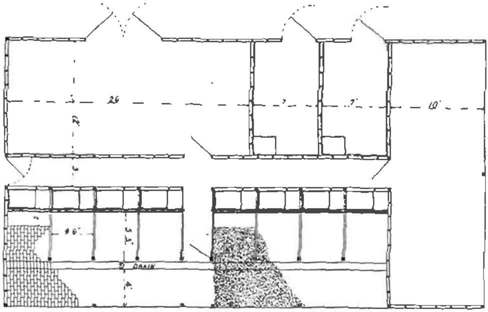


Fig. 1.—Ground Plan of an Eight-bail Milking Shed, Chaff House, and Implement Shed.

wood, spaced about 3-feet centres, well nailed to top plate ridge and hip boards (ridge and hip boards 8-inch by 1-inch hardwood). All cuts and bevels for rafters, jack rafters, and creeping rafters can be obtained by setting bevel to ones shown on the plan. Fix purlins of 3-inch by

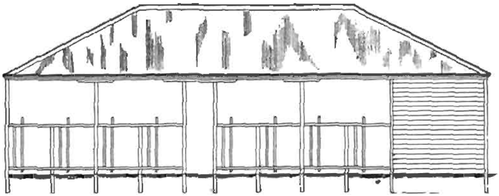


Fig. 2.—Front Elevation.

1½-inch hardwood, spaced about 4-feet centres, and well nailed to rafters to take iron. Fix collar ties as shown. Cover the whole of roof with 26-gauge galvanized corrugated iron, and ridge with 16-inch galvanized iron ridging, fastening same with 2½-inch galvanized spring-head nails;

give a lap and half cover to each sheet. Bails are formed with 4-inch by 4-inch posts, hardwood, sunk 2 feet in ground and mortised to receive partition rails, 4-inch by 1½-inch hardwood. Fix runners, 3-inch by

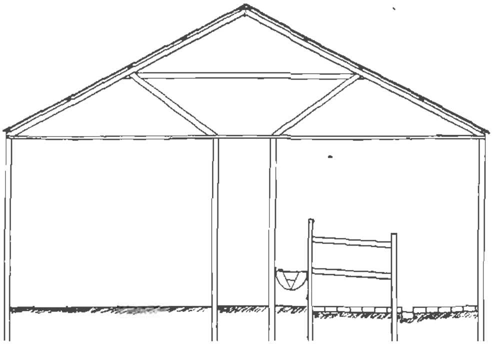


Fig. 3.—Cross Section of Building.

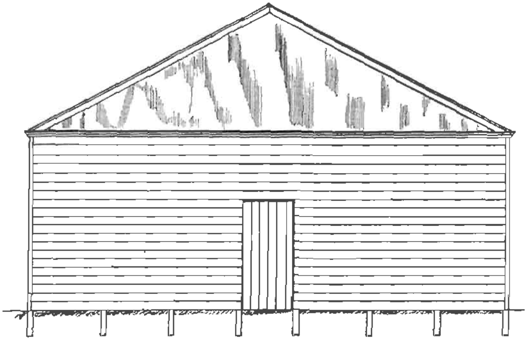


Fig. 4.—End of Elevation of Building.

1½-inch hardwood; the first pair, from the ground to top edge, is 9 inches, and the second pair comes level with the top of bail post, 5 feet from ground. The posts will require to be checked out 1 inch on each side

to receive runners, leaving 2 inches on posts to allow the bail tongues to work freely. Fix studs as shown. The first stud is 12 inches to furthest edge from post, and between this stud and bail tongue is 7 inches (a 6-inch bolt is allowed for bail tongue). The feeding troughs are made as shown on plan; the ends are of 6-inch by $\frac{7}{8}$-inch T. and G. flooring, crossed braced with the same material; the ends of troughs are cut to a half-circle. Fix a 3-inch by 1-inch batten at top edges of troughs to act as stiffening pieces. Starting from the bottom edge of outside batten, nail with 1¼-inch clout tacks, 24-gauge galvanized flat iron, bending it to the circle. On the top edge of the iron form a roll

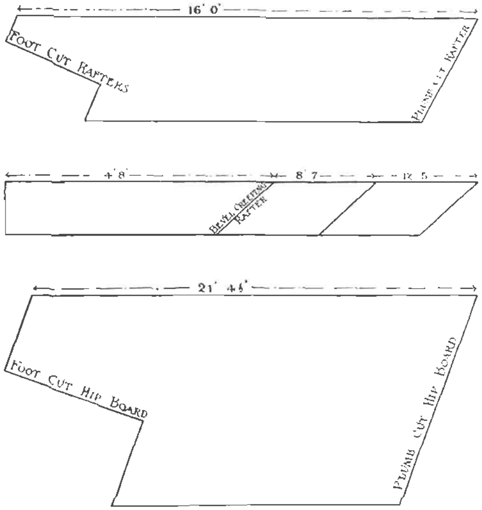


Fig. 5.—Rafters.

(to take a piece of pipe 1-inch diameter), and well rivet same. Fix a piece of pipe, 1-inch diameter, to studs, 3 feet from floor, with strong staples, to act as a hinge to allow the troughs to be tipped back for cleansing purposes. Fasten on top edge, and 3 inches from back, a 3-inch by 1-inch batten; this will prevent the cows from nosing food over the backs of feed trough. Fix a 3-inch by 1-inch batten to bail posts to rest front of feed trough on. In loose-boxes, line up walls internally for 6 feet with 6-inch by 1-inch hardwood, and provide a feed-box in each, made of 6-inch by $\frac{7}{8}$-inch T. and G. flooring.

For the chaff-house, a pair of doors are provided to fit an opening 7 feet by 8 feet, and a single door 6 ft. 6 in. by 3 feet; passage doors (two) 6 ft. 6 in. by 3 feet, and loose-box doors 7 feet by 4 feet, cut through the middle on an angle. All doors to be braced diagonally, and ledgers to be of 6-inch by $\frac{3}{4}$-inch T. and G. flooring, hung with 18-inch T hinges and fastened with 12-inch tower bolts. Make a single gate

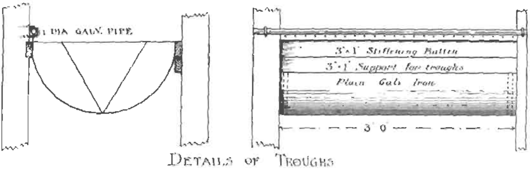


Fig. 6.

for passage between cow bails out of 4-inch by 3-inch and 3-inch by 2-inch heads and 3-inch by 2-inch and 3-inch by 1-inch rails. Heads are to be mortised out to receive rails top and bottom; rails are 3 inches by 2 inches, and intermediate rails 3 inches by 1 inch; hang with 18-inch T hinges, and fasten with 12-inch bolts. The floor may be laid with

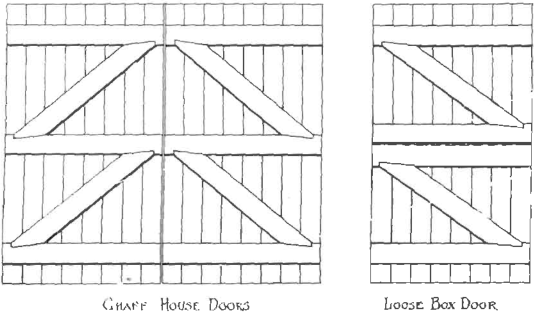


Fig. 7.

bricks, or concrete. If bricks are used they should be laid on a sand bed and well grouted with cement, 3 to 1 mixture. It takes 1,000 bricks for the front portion of cow bails; 2 feet may be filled in with clay and well rammed. If concrete, the quantity required is 5 cubic yards, to cover 5 inches deep, and the approximate cost is, labour and material, £1 15s. per cubic yard. The whole of the exterior wall should have at

least two coats of paint, and the method of mixing concrete is given in *Journal of Agriculture*, September, 1912, page 578.

MATERIAL FOR EIGHT-BAIL MILKING SHED, CHAFF-HOUSE, AND IMPLEMENT SHED.

Stumps, redgum, 4-inch by 4-inch: forty-five, 2 feet lengths.

Hardwood—Plates, 4-inch by 2-inch; six, 18 feet; thirteen, 14 feet; four, 15 feet; four, 13 feet lengths.

Hardwood—Plates, 4-inch by 3-inch: two, 20 feet: one, 13 feet length.

Hardwood.—Plates, 6-inch by 2-inch: *one, 15 feet: one, 14 feet length.*

Hardwood—Studs and posts, 4-inch by 4-inch; seventeen, 10 feet; five, 12 *feet: eight, 7 feet: eight, 6 feet lengths.*

Hardwood—Studs, 4-inch by 1½-inch: one hundred, 10 feet lengths.

Hardwood—Rafters, 4-inch by 2-inch; eighteen, 16 feet; eight, 13 feet; eight, 9 feet: eight, 5 feet lengths.

Hardwood—Collar ties, 4-inch by 1½-inch; eight, 16 feet lengths.

Hardwood—Ridge and hips, 8-inch by 1-inch: one, 23 feet: four, 22 feet lengths.

Hardwood—*Purlins, 3-inch by 1½-inch; 700-feet run.*

Hardwood—Struts, 4-inch by 1½-inch; eighteen, 7 feet lengths.

Hardwood—Runners, tongues, and studs, 3-inch by 1½-inch: eight, 10 feet; eight, 6 feet: eight, 5 feet lengths.

Hardwood—Partition rails, 4-inch by 1½-inch; sixteen, 8 feet lengths.

Hardwood—Lining for loose-boxes, 6-inch by 1-inch; forty-eight, 12 feet; twelve, 14 feet lengths.

Hardwood—Small gate, 4-inch by 3-inch; one, 5 feet: 3-inch by 2-inch: two, 6 feet: 3-inch by 1-inch: two, 6 feet lengths.

Doors, 6-inch by ⅞-inch T. and G. flooring; three, 12 feet; eight, 9 feet: three, 8 feet; thirty-four, 7 feet: and twenty-four, 6 ft. 6 in. lengths.

Feed boxes, 6-inch by ⅞-inch T. and G. flooring; 87-feet run.

Feed boxes, 6-inch by ⅞-inch T. and G. flooring; thirty-two, 2 feet; sixteen, *3 feet lengths.*

Feed boxes, hardwood, 3-inch by 1-inch: two, 10 feet: twenty-four, 3 feet lengths.

Angle stops, out of 6-inch by 1⅞-inch T. and G.: 3-inch by 6⅞-inch; six, 11 feet lengths.

Door stops, out of 6-inch by ⅞-inch T. and G.: 3-inch by ⅞-inch: twelve, 7 feet; five, 3 feet: one, 8 feet lengths.

Weatherboards, pine, 3,500-feet run.

Galvanized corrugated iron, 26-gauge, fifty-six, 8 feet: fifty-six, 9 feet lengths.

Galvanized plain iron, 24-gauge, four, 6 feet by 3 inches sheets.

Galvanized ridging, 26-gauge, 16-inch: twenty 6 feet lengths.

T. hinges, 18-inch: ten pairs.

Bolts, eight, 6-inch by ½-inch.

Spouting, O.G., 5-inch; thirty-eight, 6 feet lengths.

Spouting brackets, 5-inch; six dozen.

Galvanized spring-head nails, 2½-inch; 28 lbs.

Clout tacks, 1⅞-inch; 2 lbs.

Tinman's rivets, ⅜-inch; 1 lb.

Downpipe, 3-inch: four, 6 feet lengths.

Wire nails, 2-inch, 84 lbs.; 3-inch, 20 lbs ; 4-inch, 8 lbs.

Bricks, 1,000.

Sand, two loads.

Cement, two barrels.

Tower bolts, 12-inch; eleven.

Braces, hardwood, 3-inch by 1-inch; 150-feet run.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commencing 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breed.	Owner.	Total, 15th April to 14th May.	Position in Competition.
		LIGHT BREEDS.		
		WET MASH.		
19	White Leghorns ..	L. G. Broadbent ..	135	1
60	.. ..	H. C. Brock	129	2
33	.. ..	A. W. Hall	126	3
6	.. ..	F. Doldissen ..	125	4
2	.. ..	E. A. Lawson	124	5
7	.. .	Marville Poultry Farm ..	123	6
25	.. .	Giddy and Son	118	7
21	.. ..	E. B. Harris	116	8
16	.. ..	N. Burston	115	9
52	.. ..	A. A. Sandland	114	10
8	.. ..	C. J. Jackson .. .	113	11
9	.. .	J. Schwabb	112	12
51	.. ..	A. H. Mould	109	13
39	.. ..	W. M. Sewell	109	
34	.. ..	H. McKenzie and Sons ..	105	15
53	.. .	W. G. Swift	104	16
5	.. ..	J. J. West	103	17
32	.. ..	F. Hodges	103	
42	.. .	W. M. Bayles	101	19
30	..	A. E. Silbereisen ..	101	
1	.. .	Mrs. H. Stevenson .	101	
46	.. ..	R. Berry .. .	99	22
26	..	A. Mowatt	98	23
4	.. ..	R. Hay	97	24
3	.. .	J. H. Gill	96	25
18	..	D. Adams	96	
36	.. ..	Weldon Poultry Yards ..	94	27
44	.. ..	Mrs. F. M. Oliver ..	94	
22	.. ..	S. Buscumb	93	29
47	. .	J. C. Armstrong ..	92	30
38	.. ..	G. McDonnell	92	
59	. ..	W. G. Osburne	89	32
57	. .	B. Mitchell	88	33
48	.. ..	C. J. Beatty .. .	88	
58	.. ..	Thirkell and Smith .	87	35
40	.. ..	C. C. Dunn .. .	85	36
10	.. ..	A. E. Tuttleby	84	37
17	.. ..	Mrs. E. Zimmermann ..	83	38
50	.. .	John Hood	79	39
11	.. ..	J. B. Brigden	71	40
24	.. .	Lysbeth Poultry Farm .	70	41
15	..	H. N. Mirams	70	
20	.. ..	R. W. Pope	66	43
13	. .	T. Hustler .. .	65	44
54	.. .	W. G. Clingin .. .	64	45
28	.. .	R. Lethbridge	63	46
31	.. ..	L. McLean .. .	60	47
12	.. ..	G. Hayman .. .	59	48
55	.. ..	W. N. O'Mullane ..	57	49
23	.. ..	Fulham Park	57	
14	.. ..	W. Flood	56	51
43	.. ..	H. I. Merrick	56	
37	.. ..	A. Ross	53	53
49	.. ..	Bennett and Chapman ..	49	54
45	.. ..	South Yan Yean Poultry Farm	49	
56	.. ..	C. Hurst	47	56
41	.. ..	J. A. Donaldson ..	38	57
27	.. ..	J. A. Stahl	5	58
		Total . .	5,075	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breed.	Owner.	Total, 15th April to 14th May.	Position in Competition.
		LIGHT BREEDS		
		DRY MASH.		
66	White Leghorns	E. A. Lawson	134	1
72	"	Mrs. E. Zimmermann	131	2
80	"	W. H. Robbins	126	3
65	"	Thirkell and Smith	123	4
62	"	Benwerren Egg Farm	123	
64	"	W. M. Bayles	122	6
79	"	Lysbeth Poultry Farm	113	7
76	"	A. A. Sandland	95	8
69	"	E. MacBrown	92	9
78	"	H. Hanbury	90	10
67	"	C. C. Dunn	89	11
63	"	A. H. Padman	86	12
68	"	H. McKenzie and Son	83	13
71	"	Moritz Bros.	49	14
73	"	C. L. Lindrea	29	15
61	"	Mrs. H. Stevenson	28	16
74	"	J. H. Gill	18	17
77	"	South Yan Yean Poultry Farm	18	
75	"	Fulham Park	9	19
		Total	1,558	
		HEAVY BREEDS.		
		WET MASH.		
81	Black Orpingtons	Mrs. T. W. Pearce	143	1
97	"	Marville Poultry Farm	135	2
94	"	D. Fisher	113	3
100	"	J. H. Wright	111	4
88	"	J. McAllan	94	5
96	White Orpingtons	Stranks Bros.	93	6
90	Black Orpingtons	Oakland Poultry Farm	88	7
91	"	A. Greenhalgh	83	8
85	"	H. H. Pump	78	9
95	Silver Wyandottes	W. H. Forsyth	74	10
87	Black Orpingtons	W. G. Spencer	72	11
99	"	L. McLean	70	12
89	Rhode Islands Red	E. W. Hippe	63	13
83	Black Orpingtons	G. Mayberry	57	14
86	"	C. E. Graham	48	15
84	"	Cowan Bros.	28	16
92	"	J. Ogden	21	17
93	"	L. W. Parker	14	18
82	White Wyandottes	J. B. Brigden	—	19
98	Faverolles	K. Courtenay	—	
		Total	1,385	

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School Horticulture, Burnley.

The Orchard.

PLANTING

June is the month usually favoured for the planting of all deciduous orchard trees, and this work should now be carried out. The ground should have been previously ploughed, subsoiled, and drained in anticipation of the planting of the young trees. The young trees should be planted to the same depth as they were growing in the nursery beds, and the holes for their reception should not be any deeper than is necessary to contain the roots. A deeper hole only provides soakage room for the soil moisture, and the hair roots are rotted as soon as they are formed. In order to keep the tree holes at an even depth, a plough furrow may be run along the whole length of the row, and each tree could then be planted to the depth of the furrow, and no deeper. By this means any soil moisture, or an excess of moisture, is evenly distributed, and is not likely to settle round the growing roots.

Before planting, the roots of the young trees should be well pruned, cutting them back hard, leaving a very small root-system; generally only about one-third of the original roots being left.

It is rarely necessary to manure newly-planted trees when they are being planted. If manure is required it should either be well worked through the soil previously, or else it should be used as a surface mulch some considerable time after planting.

In planting, growers will do well to study such varieties as are valuable as export fruit in apples and pears, and other classes are generally profitable if planted for a succession. A great deal of attention is paid to new varieties, and it is to be regretted that, in the search for newer varieties, which are so often a failure, the older and more valuable varieties may be lost sight of altogether.

An up-to-date orchard should contain very few varieties: the fewer varieties simplify many orchard operations considerably, and the crop is far more easily handled. In planting, it is also essential that the question of cross-fertilization should be studied, so that the blossoming of each variety shall help the other in the setting of the fruit.

SPRAYING.

All the winter pests will now come in for attention, and trees should be freed, as far as possible, from all kinds of scale insects, bryobia mite, woolly aphis, &c. The red oil or crude petroleum emulsion is most suitable for the eradication of these pests.

Spraying before pruning is not the general rule, and yet it seems to be the safest, especially where scales or woolly aphis are prevalent. Certainly a much larger amount of spray material will be required, but much better work will be done. There will be no danger whatever from future contamination from any of these pests on the undestroyed prunings, or from any small clippings that may be lying ungathered around the tree.

Another point in favour of this is that, if by any means, whether by careless spraying or the use of bad materials, any part of the tree is left, so that the pest is not destroyed, and so continues to increase, then a second spraying can be given while the tree is still dormant.

DRAINING.

In old-established orchards a thorough scheme of draining does more to invigorate and resuscitate the trees than any amount of surface cultivation or manuring. The work is easier done in June and July, and, where necessary, it should be started at once. Drainage pipes are more generally used, but stones, logs, waste timber, brushwood, and charcoal are all valuable as drainage mediums. The benefits of soil drainage have been so frequently urged that it is hardly necessary to repeat them again.

Vegetable Garden.

The principal work in this section for June is the preparation of beds for the main crops of vegetables. Most vegetables require, and thrive best in, a thoroughly well-worked soil, the soil being as friable as possible. The beds should be deeply worked; all manure should be well rotted, and evenly distributed throughout the soil.

One point to be emphasized is a good system of rotation, whereby a continual succession of the different classes of vegetables is grown in the beds. This is not only valuable as a method of soil restoration and improvement, but it helps to reduce and weaken any insect or fungus disease that may have been present.

Asparagus beds may now be renovated, and new beds planted. Onions and any other seedlings that are sufficiently far advanced may now be planted out, and succession crops of spinach, radish, peas, broad beans, leeks, lettuce, carrots, &c., should now be planted. The planting of rhubarb beds should now be completed.

Flower Garden.

General cleaning up and digging will be the work for this month in the flower section and shrubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, giving a fair dusting all over the surface. Lime should not be used in conjunction with leaves, garden debris, leaf mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging. In cleaning up the gardens all light litter and dead foliage should either be dug in, or better still, should be placed in an out-of-the-way corner to form a compost heap. Leaf mould is especially useful in any garden, and where such plants as Azaleas, Liliums, Rhododendrons, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves, unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wallflowers, &c., and cuttings of roses and hard-wooded shrubs may also be planted.

REMINDERS FOR JULY.

LIVE STOCK.

HORSES.—Those stabled and worked regularly should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley or linseed. Mares due to foal early if in poor condition should be fed liberally. Commence preparing stallion for season, especially if worked.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows unless in good condition should be fed liberally to stimulate milk flow. Calves should be kept in warm, dry shed. The bull may now run with the cows

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run.

SHEEP.—Class all breeding ewes. Those not found profitable in fleece, and no sign of being in lamb, if fat, should be realized on while values are high. Examine mouths of 5-year-old ewes and over: feed slips through, if any teeth are out, loose, or open. Ewes will thrive much better, and often fatten, if made "gummies."

Select best rams for future use; remember wide thick sheep are best thrivers; they must carry a profitable fleece as well. Keep all ewes about to lamb well crutched in a season like this, they will scour greatly. Free udders from wool at same time. Consider well before selling early-born, best-fleeced ewe lambs.

POULTRY.—Mating of birds intended for breeding purposes should receive immediate attention. Ten second-season Leghorns or Minorcas, or six of the heavier birds, such as Orpingtons, Plymouth Rocks, and Wyandottes (preferably in their second year), with a vigorous unrelated cockerel will be found satisfactory. Table birds bred in March or April will pay handsomely prior to the Cup Carnival. A tonic in drinking water as a preventive against chicken pox and other ailments is advantageous.

CULTIVATION.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—Continue to plant deciduous fruit trees, bush fruits, and strawberries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, early Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching, and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Complete, as early as possible, the application of manures other than nitrates and sulphate of ammonia if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 7. 10th July, 1915.

REVIEW OF THE VICTORIAN DAIRYING SEASON, 1914-15.

By R. Crowe, Exports Superintendent.

Upon nearly every occasion on which I had the privilege of addressing you I felt it was my duty to sound a word of warning through you to the dairymen of the State regarding the advisability of making provision for the feeding of the dairy cows during periods of scarcity. Unfortunately the optimistic opinions of this time last year concerning the prospects for the season just ended did not materialize, and Victoria is just now emerging from one of the most disastrous droughts ever experienced. The most provident amongst us could not anticipate a visitation of such an extraordinary and general character. There was a universal shortage of fodder both for horses, cattle, and sheep here as well as in some other States. No one could have foretold the length or severity of the drought or be expected to make full provision for such an unusual occurrence. Producers are therefore entitled to every sympathy on this occasion. One cannot but hesitate to ponder on, or attempt to estimate the extent of, the mortality amongst stock of all descriptions. The death of cattle is bound to still continue for some time to come through lowness of condition and cold weather. It was indeed fortunate that the export trade in meat and the facilities for cold storage provided an outlet for tens of thousands of stock which otherwise must have perished for want of food. Of course the particular animals slaughtered may not have died, but if not so disposed of much more than an equal number would have been displaced and lost.

The slaughter of thousands of head of dairy cows and young dairy heifers for beef purposes during the past season must seriously impair the future of the dairying industry for many years to come. You would be well advised now to use your best influence in assisting to build up to its former standard our great dairying industry. At the present moment no better way of directing your efforts could be suggested than

by using your powers to the utmost in preventing the wholesale destruction of suitable dairying heifer calves. It is only by such means that our dairy herds can again be quickly replenished.

The question of fodder conservation is all the time of pre-eminent importance, and it is sincerely to be trusted that ample provision for stock feeding in periods of scarcity will be generally adopted. Were it not for the fact that large areas of land had been devoted to irrigated agriculture for the growing of lucerne and other fodder crops, the northern parts of the State would have been practically decimated of stock. One could hardly credit the enormous carrying capacity of comparatively small areas of this land when under irrigation. On one particular area of about 14,000 acres, only some of which was irrigated, there were grazing at one time 14,000 sheep, 2,000 horses, and 1,900 head of dairy stock. Other farms were leased for terms of seven or eight months for a rental of up to £10 per acre. Unfortunately, owing to the unusually low rainfall on the one hand, and the increased demand for water for irrigation on the other, the supply practically gave out, and these veritable oases became non-productive for the time being.

What the value of such irrigated areas, in maintaining stock in good condition and checking mortality, would have been to the State had there been a sufficiency of water for irrigation purposes is hard to conceive. The losses would have been immensely reduced. The failure of our water supply for irrigation purposes towards the end of the season may then be regarded as a national calamity, as it not only concerned the users of water, but the whole community. The blame for such failure cannot be justifiably laid at the door of any body or individual. The length and severity of the visitation were unprecedented. The experience, however, should so strongly emphasize the necessity for better conservation of water as to make a like recurrence impossible.

Butter Production

The exports for the season compare with the two previous years as follow:—

1914–15	..	6,585 tons,	134 -	..	£882,390
1913–14	..	13,004 ..	115 -	..	£1,495,460
1912–13	..	12,686 ..	120 -	..	£1,519,146

The average weekly production at the moment is 50 tons, or only 20 per cent. of the requirements of consumers in this State. The total receipts of butter in Melbourne for the week ended 1st of this month was only about 2,000 cases, compared with over 6,000 for the corresponding week of 1914, and 13,000 for the same period for 1913. Unlike previous years, when supplies to make up the deficiency were obtained from the northern States, production in those places is now barely sufficient for local requirements, with a diminishing tendency, so that it looks as if a partial butter famine was imminent through the cessation of supplies from other States.

To relieve the situation, a section of the community has resolved to refrain from eating any butter for a month (according to reports in Monday morning's papers). It is most commendable that a body of consumers should in this way sacrifice themselves for the benefit of the rest. It probably costs the dairy farmer, through no fault of his own,

about double the money to produce each pound of butter at the present time as the current market price. The local dairyman who has been supplying my family with milk at 5d. per quart ceased to do so yesterday, and has gone out of the business to try and get work somewhere else. He has been losing money for some time past, and gradually exhausted his resources. Fivepence a quart equals 1s. 8d. a gallon, and, as it takes 2½ gallons of milk to make 1 lb. of butter, the producer's position can be imagined.

Since the advent of the export trade consumers have been particularly fortunate in the rate at which they have had their butter supplied them. I can recollect only one occasion when the wholesale price went up to 2s. 3d. per lb. It was in June, 1892, and the cash retail price went up to 2s. 6d. per lb. Prior to the beginning of the export business in the eighties, it was a common occurrence for the price to reach 2s. 6d. per lb. during the autumn and winter months. Judging by the present prospects there is no probability of butter forthcoming in sufficient quantity to fully supply the local demand before next August. The more one studies matters, it is recognised that this is a continent of incongruities. When an industry shows signs of languishing, it is considered, in the opinion of some people, that support and encouragement are necessary for its resuscitation and development, but if it be a rural industry, the principle apparently is not held to apply—for what reason is not understandable. The way to make butter cheap, according to the line of reasoning just quoted would be by giving more remunerative prices for the product, thus encouraging increased production, and by inducing more people to embark in the industry; but no, this principle, in the minds of a certain section of the community, should be made to apply to city or manufacturing industries only. Further comment is needless.

Quality.—The average grade of all butter examined for export for the season was 90.088 points compared with 90.47 for 1913-14. The following are particulars:—

9·67%	superfine	against	8·94%	for 1913-14.
57·68%	1st grade	against	64·89%	for 1913-14.
28·89%	2nd grade	against	23·20%	for 1913-14.
3·59%	3rd grade	against	2·65%	for 1913-14.
0·19%	pastry	against	0·32%	for 1913-14.

Although showing a slight improvement in the percentage of superfine the total above the minimum for first-grade quality is over 6 per cent. lower than for the previous season; or, in other words, there was 6 per cent. more second and third grade butter exported than for the season before.

This gradual levelling down to the lower grades is, to say the least of it, undesirable from the point of view of the future of the industry, and, unless rectified, will, I feel sure, be reflected in the prices received for our butters in the London market with the return of normal conditions

Weights.—Twenty-three consignments, representing 717 boxes, were intercepted from shipment on account of short weight. By checking these packages, 640 were passed as correct, the remaining seventy-seven having had their contents amended under supervision before export.

This compares with twenty-three consignments, representing 1,123 boxes, of which thirty-six were short in 1913-14.

Twenty-eight consignments, representing 1,201 boxes, were found to ıve both short and bare weight boxes. On checking these, 955 were ıssed as correct. Of the remaining 246 boxes, ninety-five were found ı be short weight, and 151 bare weight. They were made up and ›leased.

In season 1913-14 there were forty-two consignments similar to bove—202 were short and 403 bare weight.

Forty-eight consignments, representing 2,812 boxes, were found to ›ntain "Bare weight" boxes, and not so marked. In forty of these ›nsignments, 123 boxes were brought up to correct weight—the re-ıaining eight consignments, representing 1,339 boxes, were indelibly ınpressed with the words "Bare Weight." This compares with seventy-wo consignments for season 1913-14.

Fifty-seven factories were out of bounds as regards weight, as com-ıared with sixty-eight for season 1913-14.

Moisture.—Thirty-six consignments, representing 632 boxes, con-aining more than 16 per cent. moisture, were withheld from shipment ıntil percentage was reduced. This compares with twenty-five consign-nents aggregating 568 boxes for season 1913-14.

The average per cent. of moisture in samples analyzed was 14.37, as ›ompared with 14.06 for 1913-14, and 13.91 for 1912-13.

Twenty-nine factories offended against moisture as against twenty-›ne in 1913-14.

Butter Fat Contents.—Two consignments, representing twenty boxes, were deficient in butter fat, and were re-worked to comply with standard. This compares with the same number of consignments in 1913-14.

Salted and Unsalted.—Season 1914-15 up to 30th April, 1915:—Percentage of salted butter shipped, 62.93; percentage of unsalted butter shipped, 37.07.

Condemnations.—Two consignments, representing sixteen boxes, were, on examination, found to be unfit for human consumption—they were seized. This compares with three consignments in season 1913-14.

Quality.—The conditions prevailing, both here and in London, of late years, have lulled butter-makers into a false sense of security as regards quality. Good and uniform prices have been obtained for almost any quality of butter, thus naturally providing an incentive for relaxation in the care of and grading of the cream and the manufacture. With a return to normal conditions, both here and abroad, those engaged in the dairying industry will receive a rude awakening, unless some practical steps are taken to stop the present tendency in regard to prices in relation to the quality of our butter. The margarine manufacturer is abroad, and prosecuting an energetic campaign when the conditions are so favorable. Many consumers, owing to the exigencies of the war and the high price of butter, find themselves in the position of being unable to purchase butter, and must resort to margarine. Owing to the great improvement that has taken place in the manufacture and preparation of margarine, it is reasonable to conclude that a considerable proportion of those consumers will be captured by the margarine manufacturer to the detriment of the butter trade. Quality is our only safeguard in this matter, and relative price should be an essential corollary, and upon these depend the future of dairying and the successful settlement of our country. No other industry can take the place of dairying, and consequently it must be regarded as an important national asset. Poor quality should mean reduced prices,

which, in turn, reduces the value of land, and stock, and labour, thus every one of us is interested, and we should all unite in an effort to place dairying on a more satisfactory basis. By securing relatively high prices for good quality butter, an incentive is given to produce an improved article. During recent years, unfortunately, it has been more profitable; in other words, it paid better to manufacture a medium or poor quality of butter than a high class article. The difference in price between the two was not sufficient to warrant a continuance of the increased cost involved in the production of a superfine product. It costs more to deliver or collect cream at frequent and regular intervals, and pasteurize and cool it, than to have it dealt with in a slipshod manner, and when the difference in price proves insufficient to warrant a continuance of the additional outlay, it is only a matter of time when it is dropped.

Uniform Butter Grading.

The question of uniformity of grading throughout the Commonwealth has been exercising the minds of the authorities for some months past. There was no wide divergence of opinion in regard to what constitutes the various grades of butter as prescribed by the Commerce Regulations. The Senior Inspector of Dairy Produce, Mr. P. J. Carroll, was deputed to attend a conference of graders in the State of New South Wales in August last. New South Wales, Queensland, and Victoria were represented at that conference, and after carefully grading numerous samples of butter, it was found, on comparing results, that only in a few instances were there any differences in the actual grade of the butter. After discussion and a further re-examination of these particular butters, it was concluded that, as far as flavour was concerned, the standard of the different States was uniform. In Queensland and New South Wales the standard for texture and condition was on a more strict basis (particularly the latter State) than Victoria. The delegates agreed that, in order to bring about greater uniformity under these two headings, New South Wales and Queensland should relax slightly, and that Victoria, to meet this alteration, should adopt a higher standard for texture and condition. This fact is mentioned so that you may be prepared to meet the amendment by the adoption of a higher standard in the manufacture and get-up of your butter in future; although all the time, regarding flavour as the prime essential in butter, no maker or factory manager should risk the grade of his butter by adopting or permitting slipshop methods in manufacture. With this slight alteration in the grading under the headings of texture and condition, no necessity is seen for any drastic amendment in the present standard of points under which butter is graded. Any variation in the present basis of grades, which has been continuous in this State for nearly twenty years, would lead to a good deal of confusion amongst manufacturers and London purchasers. Fundamentally, the system is sound. It is universally recognised, and any material alteration would mean sacrificing the confidence earned of all parties concerned.

Technical Instruction.

With the almost universal adoption of the home separator throughout the State, the conditions of butter-making have very materially changed, and the lot of the factory manager during the transition stage is not

an enviable one. The dairymen themselves are not educated in the manner of caring for their cream, and the practice of irregular delivery is making serious inroads into the quality of our best factories' butters The adoption of pasteurization and neutralization, which has been successfully undertaken by some of the factories, is worthy of serious thought and further extension. Departmental officers will be available, in the slack season of the year at any rate, to render what assistance they can to factory managers who desire information on these and other matters. The present condition of the industry, however, warrants whole-time instructors, as, when instruction is most needed, the present staff are otherwise occupied. If we are to maintain our position here, in Victoria, as butter producers, in comparison with other States and New Zealand, some practical steps will require to be taken, and that promptly, to improve the present quality of many of our factories. Directors and managers can do their share by organizing methods for the frequent collection of cream, without which no amount of instruction will ever achieve the end desired. Given a good system of cream collection, and intelligent application of the means at our disposal in the factory, there is no reason why the product of Victorian factories should not touch as high a level as it did prior to the advent of the home separator.

Scientific Instruction.

The following syllabus, drawn up by the Department of Agriculture and the University authorities, is tentatively submitted for consideration, and will in itself convey the scope of the proposed instruction. On account of the past disastrous season it cannot be hoped that it will be adopted at once, but with the hope of better seasons ahead this phase of the factory manager's education must not be lost sight of.

Class for the Scientific Instruction of Butter Factory Managers.

A class for the scientific instruction of butter factory managers will be held at the University and one of the Melbourne butter factories during June and July, commencing on Monday, 14th June, and ending on Friday, 6th August.

The University work will comprise:—

- (*a*) Lectures and laboratory work on the chemistry of milk and its products, by Dr. Rothera.
- (*b*) Demonstrations and laboratory work in the practical bacteriology of the dairy and factory, by Dr. Bull.
- (*c*) Lectures on dairy farming in relation to the factory supplies by Professor Cherry.

The butter factory work will include lectures, demonstrations, and factory practice by Messrs. Archer and Carroll.

The course will also include practical demonstrations in dairy farming, management of the herd, and handling of the milk at the Central Research Farm, Werribee.

With regard to the practical work to be undertaken, the drawing up of a time-table has been deferred until the Managers' Association was consulted, and the Association is asked to give special consideration to this matter in consultation with Messrs. Carroll, Senior Inspector Dairy Produce, and Archer, Senior Inspector of Dairies.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Bee Expert.

(Continued from page 304.)

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

Gippsland Box (*Eucalyptus Bosistoana*).

(Fig. 23.)

A tall tree running up to over 150 feet with a stem diameter of 3 to 4 feet. The bark is rough on the trunk at the base, but smoother towards and on the branches. The leaves are mostly narrow lance-shaped, but variable in shape on the younger trees, they are generally dull green on both sides, the veins are faint, rather far apart, the marginal vein removed from the edge of the leaf. The leaves of young seedlings are roundish or egg-shaped, stalked and scattered on the stem. The umbels are few-flowered, and at the shoulders of leaves; the buds are egg-shaped, with a pointed lid. The fruit is comparatively small, nearly half-egg-shaped, with five to six, rarely four cells, and a narrow rim.

The wood is close-grained, brownish to yellowish-white in colour, and very durable; it is used for piles, railway sleepers, bridge-decking, waggon-frames, spokes, felloes, and fence posts.

This tree is in Victoria confined to the eastern parts, occurring chiefly in the Bairnsdale district. It is known by various local and confusing names, such as box, bastard box, grey box, and yellow box.

Pollen is gathered from the blossoms by bees, the flowering occurring generally in February. Owing to its flowering concurrently with other eucalypts in the same locality, no data are yet available of the amount and the character of the honey obtained from it.

The Giant Gum Tree.

(*Eucalyptus regnans.*)

Fig. 24.

This tree is closely allied to the Narrow-leaved Peppermint (*Eucalyptus amygdalina*), it is known as Blackbutt, Mountain Ash, and even White Gum. In Victoria it occurs over a wide area in South and Western Gippsland together with Messmate (*E. obliqua*), and Blue Gum (*E. globulus*).

It is the largest tree in Australia, trees over 300 feet high being known in Victoria. It was formerly held to be of much greater height, as much as over 400 feet; authoritative measurements have, however, since reduced it to somewhat over 300 feet.

The following description is extracted and the illustration (Fig. 24) taken from Mr. J. H. Maiden's *Forest Flora of New South Wales.*

The mature leaves are lance-shaped to broad lance-shaped, thinning on both sides, usually thin in texture (but sometimes quite leather-like), veins slightly spreading, oil dots extremely numerous. A common method of recognising *E. regnans* is to hold up a leaf to the light and to notice the fine oil dots which cover its surface, but this characteristic is possessed by the leaves of a few other species.

Fig. 23.—Gippsland Box (*Eucalyptus Bosistoana*, F.v.M.).

The juvenile leaves of young seedlings are broad, lance-shaped, and opposite, but soon become scattered on the stem and broad lance-shaped, unequal-sided, pointed very like those of Messmate (*E. obliqua*) saplings. The buds are rounded to pointed conical in clusters occurring singly or in pairs. The fruits are variable in size and shape, the stalk of the cluster is often an inch long.

The bark is more or less fibrous in the under layers on the butt of the trunk. On the giant trees there is very often little of this bark, the upper portion resembling a White Gum. On other trees of the same species the fibrous bark runs further up the trunk, and thus it follows that the same species may locally be called either a White Gum or a Blackbutt.

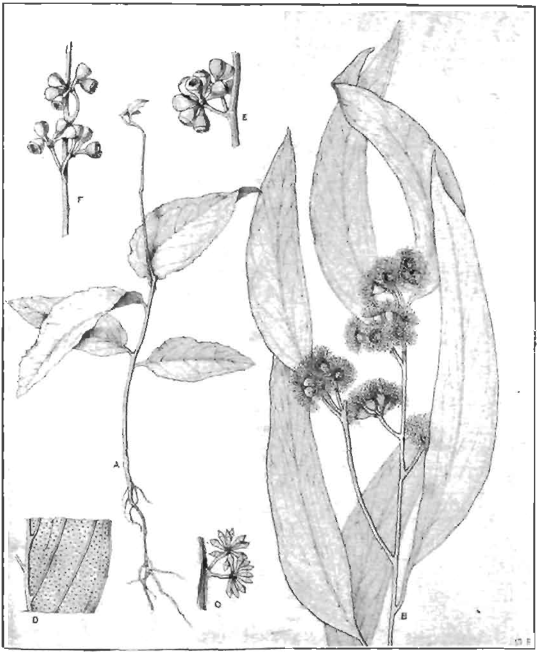


Fig. 24.—The Giant Gum Tree (*Eucalyptus regnans*, F.v.M.).

The timber is pale coloured, very fissile (free in grain) and therefore well adapted for palings, shingles, and fence rails; it is also extensively used for saw-mill purposes.

As to the value of the Giant Gum for bee-keeping purposes, nothing is known, as it occurs in districts where commercial bee-keeping is not yet carried on, and therefore no observations have been made as to the

amount and character of the honey, and whether it furnishes pollen for bees; but it is probable that in this respect it resembles the closely-

Giant Forest Tree in Victoria.
Giant Gum Tree (*Eucalyptus regnans*), Narbethong, Vic.

allied species *E. amygdalina* (Narrow-leaved Peppermint) and *E. dives* (Broad-leaved Peppermint).

The Narrow-leaved Peppermint (*Eucalyptus amygdalina*).

(Fig. 25.)

The peppermint eucalypt of Victoria, New South Wales, and Tasmania, occurring in Victoria on the poorer soils, in the cooler districts. In some localities it is known as "Messmate," from which, however, it is

Fig. 25.—The Narrow-leaved Peppermint (*Eucalyptus amygdalina*, Lab.).

very easily distinguished and in the company of which it often grows. Eucalyptus amygdalina is the tree from the leaves of which most of the commercial eucalyptus oil is distilled.

A tree usually small or moderate-sized, but sometimes attaining considerable height, the bark is fibrous on the trunk and larger branches,

but usually smooth higher up. It is grey or brownish-grey in colour, and not so fibrous as that of stringybark.

The leaves are narrow, long lance-shaped, sharply pointed, rather thin; the veins are few and oblique, not prominent; usually the foliage is dense and drooping; the buds are short-pointed, generally very numerous in the umbels; the fruit small, with a flat or slightly concave rim.

The peppermints, of which there are several, are readily distinguished from other eucalypts by the strong peppermint odour of the leaves when bruised.

The wood is pale-coloured (nearly white) when newly cut, but dries to a pale brown, it often contains gum veins, is of inferior durability, but occasionally used for fence posts and shingles, and makes fair fuel.

The narrow-leaved peppermint blossoms from October to December, practically every year, and rather profusely, but it does not appear to be of much value to the beekeeper. In the writer's experience of twelve years' beekeeping in peppermint country it never yielded enough nectar or pollen to be noticeable in the hives, and the yields of peppermint honey sometimes reported were probably obtained from other eucalypts called peppermint in that locality.

In the Beechworth district, however, it sometimes yields well. The honey is not first class, and candies quickly and very hard.

THE BROAD-LEAVED PEPPERMINT.

(*Eucalyptus dives.*)

Fig. 26.

A tree of medium size, but often flowering as a tall shrub, occurring in Victoria chiefly in the North-Eastern portion, and in a dwarfed state on part of the outer fringe of the Grampians. It closely resembles the Narrow-leaved Peppermint (*E. amygdalina*), together with which it grows in some localities. The leaves are generally broader than those of the latter; the chief distinguishing feature, however, is the sucker leaves, which are quite narrow in one and broad in the other, as will be seen on reference to the illustrations (Figs. 25 and 26). Generally speaking, the Broad-leaved is more aromatic than the Narrow-leaved Peppermint. the odour different, though difficult to describe, and the fruits are usually larger.

The leaves are broadly lance-shaped, nearly symmetrical, and usually rather thick, the veins spreading and conspicuous. The buds usually blunt, but not distinctly rounded. It is a profusely-flowering species, with clusters of eight to twelve and even more flowers. The fruits are sometimes nearly half-round, or more or less inclined to pear shape.

The timber is pale-coloured, full of gum veins, and almost useless excepting for fuel.

This tree is known also as Peppermint, Blue Peppermint, and in the North-East of this State as Messmate.

As a honey-yielding tree it does not rank very high; like the Narrow-leaved Peppermint, it is so far reported as nectar producing only from the North-Eastern District.

The honey is somewhat paler than that of the Narrow-leaved Peppermint, which, however, may be due to admixtures of honey from other

Fig. 26.—The Broad-leaved Peppermint (*Eucalyptus dives*, Schauer).

sources. It candies quickly. No information is available as to whether it yields pollen for bees.

(*To be continued.*)

TOBACCO BEDS FOR BLUE MOULD.

By Temple A. J. Smith, Tobacco Expert.

Make cold frame for beds by putting 6-in. or 12-in. hardwood boards on edge round the area selected, which should be a rich patch of sandy loam or well-drained soil of good quality. Form the beds 3 feet wide, and any convenient length. A bed 3 feet wide and 10 feet long should provide plants sufficient for 2 acres, though careful growers generally sow two or three times this area to have a plentiful supply.

A useful-sized plot for, say, 9 acres of plants would be 18 feet by 30 feet. This makes a convenient size for five beds 30 feet long and 3 feet wide, with paths of 1 foot in width between each bed. Canvas and cheese-cloth coverings also fit in well to frames of these dimensions.

The soil should be worked to a depth of 4 inches, and brought into a very fine tilth, all roots and stones or rough material being removed during the process, as the seed, being very small, requires a fine seed-bed.

Some growers believe in burning wood or litter of any description on the surface of the plot before working it up to destroy the larvæ of insects, and also any seed of weeds in the soil, and the system is a good one.

Where the disease known as "Blue Mould" is prevalent, the following treatment has proved highly beneficial:—

After the beds have been worked in the manner described, the surface soil to a depth of 3 inches should be turned back, and 1 lb. of unslacked lime spread on the bottom to each square foot of surface.

On the lime ¼ oz. of carbolic acid crystals to each square foot should be sprinkled, and the soil replaced on top of the lime and crystals.

The bed must then be watered with a solution containing 1 lb. of carbonate of potash and 1 oz. of bluestone dissolved in 40 gallons of water, this amount sufficing for 30 feet of beds.

The bed should immediately after watering be closely covered with old bags, tarpaulins, or any material that will keep the heat and fumes in the soil.

The effect of the mixture is to thoroughly fumigate the soil to a depth of 4 inches, killing all fungoid germs and insect larvæ. A considerable heat is generated owing to the action of the lime, acid, and water. As soon as the bed cools down, the soil should be thoroughly mixed with the lime, and sown before it has become actually cold.

The seed should be mixed with dry sand or powdered ashes, and sown on the surface of the beds at the rate of 1 oz. of seed to every 50 square yards. This is fairly heavy seeding, and with good heavy seed half this amount is often sufficient. The seed having been sown on the surface, and pressed into the soil with a board, or lightly brushed in with a soft broom, the beds should then be covered with cheese-cloth or light open hessian, which is stretched across the top of the frame of hardwood, and prevented from sagging on to the soil by the insertion of pegs every 6 feet, or battens placed across the frame about the same distance apart.

The beds should be kept moist, but not wet, especially during the early stages of growth, and watered with a light rose, or sprinkler, so as not to wash the seed off the beds into the paths.

Before transplanting, the plants should be hardened by exposing them to the sun by turning back the cloth covering for an hour or two each day for three or four days. This is best done in the mornings before the sun gets too much power, especially for the first time or two.

Weeds should be kept out of the beds, and if the plants come too thickly they should be weeded out, the intention being to allow each one as nearly as possible a square inch in which to develop.

The system advocated has proved so satisfactory during the two years' trial given that it can be safely recommended as a great preventive, if not a cure, for blue mould; beds so treated not only were free from the disease, but were not affected by insects, and the plants grew quicker and better, while all the beds round them died off and were failures.

There can be no doubt that the addition of lime to the soil is beneficial, also the potash, both of which are essential for successful tobacco growing.

The covering of the beds with cheese-cloth is also a great improvement on the old open-bed system. Less watering is required, and a more regular temperature preserved, danger from frost is avoided, and moths and other insect pests kept out.

A further advantage in growing plants under a cold frame exists in the fact that, should mould appear, the temperature under the covering can be raised to 80 or 90 degrees F. by using hurricane lanterns, which has the effect of preventing the spread of the disease. Care must be taken not to raise the heat over 90 degrees F., or the plants will scald, and anything over 80 degrees F. is sufficient to kill the spores of the disease.

The whole cost of this treatment is very slight, and less labour is required to weed and prepare beds, as a lesser area is sufficient. The hardwood boards will last for many years, but the cloth covering will require to be renewed every second season.

The same site can also be used for many years, and will even improve under good management, which means rational manuring with farm manure and artificial fertilizers.

SOIL TEMPERATURE.

AN IMPORTANT FACTOR IN SCIENTIFIC AGRICULTURE.

By L. R. Pritchard, B. Agr. Sc. Field Officer.

The successful propagation of plant life depends upon many favorable conditions being present in the soil, and by no means least among these is soil temperature.

Before the vital processes involved in growth become active a certain temperature is necessary, which, according to most authorities, lies between 40° F. and 45° F. for the plants comprising the ordinary farm crops, while it is generally accepted that a temperature of 41° F. is necessary for the beginning of vegetative growth.

Soil temperature is one of the essential limiting factors of plant growth; it affects three important functions in the soil, *e.g.*, the biological, chemical, and physical functions.

The biological function comprises—

- Germination.
- Maximum growth of the plant.
- Osmotic absorption of moisture by the roots.

The chemical function comprises—

- The acceleration of all chemical actions.
- The solvent action of water.
- Osmotic pressure; a rise of temperature increases the osmotic pressure.
- Formation of nitrates; favoured by heat.
- The weathering of rocks.
- Decomposition of organic matter.

The physical function comprises—

- The movement of soil moisture as influenced by changes in temperature.
- The movement of the air.
- Disintegration of rocks; expansion and contraction due to changes in temperature.

The connexion between soil temperature and vital processes is most apparent in the case of "germination," for which not only is a certain minimum temperature necessary, but for several degrees above this minimum germination may be so slow and irregular that the young plant is liable to perish while remaining in such a critical condition. That is to say, there is also a certain optimum temperature, generally several degrees above the minimum temperature, at which germination will take place most favorably, and at which temperature the subsequent vital processes will proceed to form a healthy plant.

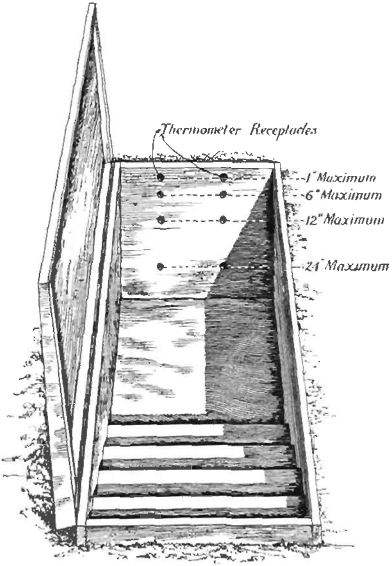
The following table, as compiled by A. D. Hall in *The Soil*, p. 125, shows the range of temperature for the germination of various cultivated plants:—

Temperatures of Germination.

—	Fahrenheit.		
	Minimum.	Optimum.	Maximum.
Wheat	32°–41°	77°–88°	88°–110°
Barley	40°	77°–88°	100°–110°
Oats	32°–41°	..	80°–100°
Pease	38°–41°	..	..
Beans	49°	91°	115°
Maize	49°	91°	115°
Cucumber, Melon, &c.	60°–65°	88°–99°	110°–120°

"The practical bearing of these figures is obvious. It is necessary to sow some seeds, like the melon, in heat, and to defer the seeding of other crops, like maize, until the ground has acquired not only the temperature necessary for germination, but one that will insure a subsequent rapid growth of the seedling plant."

It is well known to-day the important part played by soil bacteria in the nutrition of crops, and it is a point of some significance that the beneficial bacteria are active within about the same limits of temperature as have been indicated above for the higher plants. The nitrification bacteria, for example, cease their work below 41° F. and above 130° F., their period of greatest activity occurring when the soil temperature registers about 99° F.



SOIL-TEMPERATURE PIT
AT
CENTRAL RESEARCH STATION
WERRIBEE.

The importance of soil temperature in the initial stages of the growth of plants has been dwelt upon, but the plant, once firmly established, is subject to a good deal of modification from this source also. The osmotic absorption of water by the roots of a plant is controlled by the temperature of the soil, and it may happen that the temperature of the soil becomes so low as to temporarily suspend the absorption of

water by the roots, while the aerial portion of the plant still continues to transpire water in a favorable atmosphere. If such be the case, the plant wilts, and if the action extends over any length of time, disruption of the cells takes place and the plant is killed. This is generally what happens to plants during a frost. It is not the actual cold which affects the plants, but the drying-out process which a low soil temperature produces. In such a case any protection to the plants, such as that afforded by a covering of straw, dead leaves, &c., will prevent the destruction of the plants; not, as is popularly supposed, by the plants being kept so much warmer, but simply that the evaporation from the plants is reduced to a minimum.

Sources of Soil Temperature.

Farm soil receives its heat from four sources, *e.g.*, from—

(1) Direct radiation from the sun.

(2) Precipitation or condensation of aqueous vapor.

(3) Interior of earth, by conduction.

(4) Decomposition of organic matter.

The heat derived from the last three sources—the first two of which are entirely beyond the control of man—is very small in comparison with the heat derived from the first and greatest source, *e.g.*, the direct radiation of the sun.

The only source to be practically under the control of man is that mentioned last, and here, again, the source of heat may be derived as the result of two operations, *e.g.*:—

(*a*) The decomposition of vegetative matter, as occurs in the familiar practice of green manuring.

(*b*) The decomposition of stable manure when applied to the soil in considerable quantities.

N.B.—Horse manure raises temperature most.
Cow manure raises temperature intermediate.
Sheep manure raises temperature least.

While these latter sources of heat have been mentioned more from the interesting than the utilitarian aspect, it may be again stated that the main source of soil heat is that derived from the radiant energy of the sun. It has been calculated by Langley that the radiant energy received by an average seed bed of 4 to 5 inches in depth, if wholly absorbed, is sufficient to raise the temperature of that seed bed as much as 90° F. in an hour. The sun's rays, however, are not wholly absorbed by the soil, being reflected in varying degrees, according to the nature and colour of the soil. Dark-coloured soils absorb more than light-coloured soils, and well-tilled* surfaces retain their warmth near the surface, whereas the heat is conducted to the lower layers beneath an unworked soil surface.

* When a soil is cultivated, the area of its surface exposed is by far greater than that of an undisturbed soil, and, of necessity, the amount of evaporation from the former is greater than from the latter. As a result of this difference in evaporation, the temperature of cultivated soil does not rise at the beginning as high as that in uncultivated soil. As soon, however, as a dry mulch is formed on the cultivated soil its loss of moisture by evaporation is reduced considerably, while the loss from the undisturbed soil is still large, and consequently its rise of temperature is small. On the other hand, the heat that is not expended on the evaporation of water is rapidly conducted downwards in the case of uncultivated soil, while with the cultivated soil only part is conducted down and the remainder radiated.

There are many other factors at work in Nature tending to reduce soil temperature, but these factors will not admit of being discussed here.

Thus it will be seen that the subject of soil temperature is a most complex problem, and in order to arrive at conclusions which are at all definite it must be investigated from many stand-points, and, as far as possible, under both natural and controlled conditions.

With the object of demonstrating and studying the diurnal variations in soil temperature, and in what relation these variations stand to varying depths of soil, an interesting set of observations, embodying

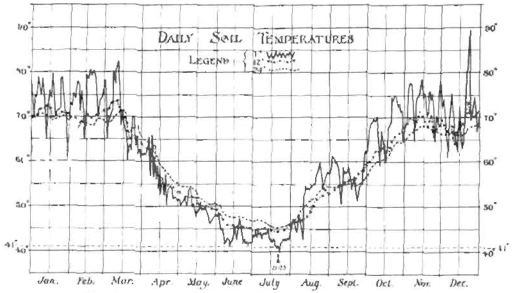


FIG. 1 MEAN OF MAXIMUM & MINIMUM TEMPERATURES

daily readings of maximum and minimum thermometers is being carried out at the Central Research Station, Werribee. In the northern face of a specially-constructed pit a maximum and a minimum thermometer have been placed horizontally at each of four depths in the natural soil, *e.g.*, at depths of 1 inch, 6 inches, 12 inches, and 24 inches, respectively, from the surface of the soil. The construction of the thermometer receptacles and soil pit is such that the effects of any external atmospheric temperature on the readings of the soil thermometers have been reduced to a minimum, so that the temperatures recorded by the thermometers represent the actual soil temperatures at the above depths. The readings are taken at 9 a.m. every day throughout the year, and carefully recorded on a special temperature card.

When the means of the maximum and minimum temperature for each depth are plotted in the form of graphs, many interesting and important factors are brought to light. By reference to Fig. 1 it will be seen that the 1-inch graph is a series of variations which oscillate from day to day, and clearly illustrates the wide ranges of temperature to which the surface soil is exposed.

It will also be noticed that, as the depth increases, the temperature variations diminish in amplitude. Even at the 24-inch depth the daily variations are practically negligible, the 24-inch graph being represented

by a gradual rise or fall. Another point of interest is that each curve cuts each other curve at least twice during the year; for a certain period the upper layer of soil is giving, and for the remainder of the year is receiving, heat from the layer above or below. In the warm months of the year the 1-inch curve occupies a position above the other curves, but

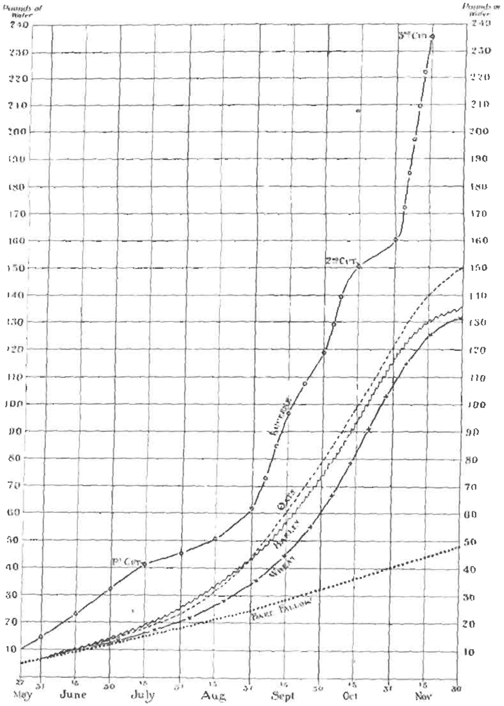


FIG. 2. TRANSPIRATION & EVAPORATION CURVES

during the cold period of the year the positions are entirely reversed, the layers of soil furthest removed from the surface registering the higher temperatures.

As has already been mentioned, vegetative growth is dormant below 41 deg. F., and by reference to Fig. 1 it will be seen that the temperature

of the 1-inch soil layer fell below the 41 deg. F. only once during the whole year, and then for a very short period, *e.g.*, *three* days—21st to 23rd July inclusive. From this data it would be safe to infer that vegetative growth as far as the Werribee soil was concerned was never at a standstill at any period of the year, for by the period mentioned—21st to 23rd July—all winter crops were firmly established with their roots in the deeper layers of soil where the temperature was more congenial.

This assumption is confirmed by reference to Fig. 2, which illustrates in graphic form the "Transpiration and evaporation" curves of wheat, oats, barley, and lucerne plants growing in close proximity to the soil temperature pit, and under comparatively identical soil temperature conditions. The curves show no decided break in continuity, which would be indicative of a check in growth at any stage in their growing period. Another point of interest in reference to Fig. 1 is that the increase of temperature from spring to summer is more rapid than the decrease from autumn to winter, as is exemplified by the relative steepness of the curves.

These few soil temperature observations have brought to light many points of interest, and as more data is made available by the pursuance of these records over a number of years, more definite conclusions will become available to extend our scope of a subject which, besides being very complex, has an important bearing on vegetative growth.

RETURN OF LIVE STOCK IN VICTORIA, MARCH, 1915.

Districts.	Horses.	Cattle.			Sheep.	Pigs.
		Dairy Cows (milking and dry).	Other Cattle.	Total.		
Central	118,402	122,310	106,190	228,500	1,289,698	41,175
North-Central ..	32,992	39,296	48,243	87,539	1,000,461	11,786
Western	87,169	165,494	162,590	328,084	4,020,120	60,870
Wimmera	63,279	19,757	21,361	41,118	1,556,566	7,365
Mallee	42,847	11,502	14,717	26,219	404 135	7,211
Northern	102,074	62,274	63,698	125,972	1,355,410	25,759
North-Eastern ..	45,715	51,136	119,905	171,041	1,044,310	20,395
Gippsland	59,575	138,748	215,321	354,069	1,380,985	68,635
Total March, 1915	552,053	610,517	752,025	1,362,542	12,051,685	243,196
.. 1914	562,331	656,080	872,473	1,528,553	12,113,682	221,277
Increase	..	..	..	..	..	21,919
Decrease	10,278	45,563	120,448	166,011	61,997	..

A. M. LAUGHTON,
Government Statist.

Office of the Government Statist,
Melbourne, 17th May, 1915.

COST OF PRODUCTION OF FIELD CROPS.

I.—WHEAT.

By H. C. Wilson, Manager Central Research Farm, and A. J. Whelan, Field Officer, Werribee.

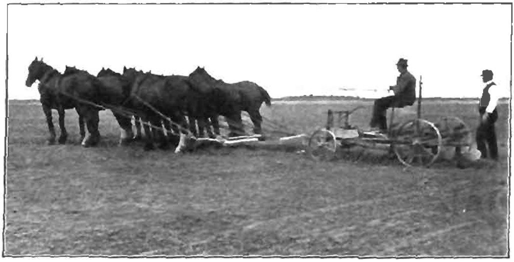
During the late autumn months of 1914 it was decided by the Department of Agriculture to put under wheat a field of 345 acres acquired on lease from the Closer Settlement Board, and to record exactly the total cost of production.

Operations commenced on 20th June, 1914.

Previous History of the Land.

Before taking over the lease of this land in June, 1914, grazing had been practised for a period of six years, leases being granted from time to time by the Closer Settlement Board to graziers.

By local information gathered it has been ascertained that this land carried six cereal crops during the years 1899-1908, many of which during the later years of this period being taken consecutively.



Ploughing with Stump-jump Plough, Research Farm, Werribee.

The Soil.

The soil is very patchy, varying from stiff red clay loam to light grey loam, with occasional low black beds of soil, badly drained. Of this latter soil there is about 2 acres only. The subsoil is near the surface, and, although the ploughing was only 4 inches deep, the clay subsoil was brought up by the implements in places. This subsoil varies from yellow, tenacious clay to permeable, red clay loam of basaltic formation. Its valuation should be £8 per acre.

Natural Grasses, Herbage, Pest Weeds, &c.

As this paddock has not been cropped for the past six years, the natural native pasture was good and established. The pest weeds were hardly noticeable.

Because of the constant grazing practised, the annuals have become so scarce that they could be noticed only in patches, this condition favouring the perennial native root-grasses, and encouraged their predominance in the pasture.

Preliminary Work.

A start was made on 20th June, 1914. Owing to the distance of this land from the farm buildings (some 3 miles), the erection of rough camping conveniences for men and horses was undertaken before the ploughing, at a cost of £4 11s. 6d. This work included sinking a small water-hole, erection of some 4 chains of fencing, feeding arrangements for horses, and the shifting of a 12-ft. x 15-ft. iron hut for the men from the farm homestead

Fallowing.

On the 26th of June, 1914, two four-furrow ploughs were started (one disc and one mould-board), with six horses in each, ploughing to a depth of 4 inches. The weather was favorable, and six working days a week were realized, the horses being actually in the ploughs for about 8½ hours a day during the greater part of the ploughing season.

The condition of the soil was very good at the outset of operations, but as the work progressed, rain being scarce in the late winter months, some difficulty was experienced in maintaining the requisite tilth, and owing to the scarcity of these winter rains it was decided to follow the ploughs with a heavy double harrowing, keeping the work well in hand. These fallowing operations were completed on 3rd September.

Summer Working of Fallows.

During the period 24th September to 12th December, 1914, the whole of the area was again double harrowed, and during 28th November, 1914, to 26th January, 1915, a spike rolling and harrow attached behind was undertaken. After the roller came the spring-tooth cultivator tilling to a depth of 3½ inches from 26th December to 27th February, 1915. The condition of the soil after this last working being considered satisfactory, a cessation of the work was allowed until seeding commenced on 17th April.

Seeding Operations.

The whole of the land was harrowed with heavy harrows immediately before and after the drills, and the seeding operations, which were favoured with ideal weather conditions, occupied from 17th April to 3rd May. Two seventeen-hoe disc drills and two sets of six harrows each were used. On the whole, a very excellent germination resulted; 1.72 inches of rain fell the week before the seeding started, and 2 inches the week after completion. These rains were very seasonable. The 1.72 points which fell previous to seeding came steadily, and soaked well into the ground, while the 2 inches which were recorded immediately after seeding was distributed over a period of eight days, thus insuring a very excellent germination. At the date of this report a very even crop is to be seen, consisting of twelve separate varieties of pure seed wheat to be marketed as seed next season. The varieties sown are:—Federation, Yandilla King, Marshall's No. 3, Penny, College Eclipse, Warden, Dart's Imperial, Commonwealth, Currawa, King's Early, Hugenot, and Zealand Blue. These are representative varieties of the best known Australian wheats.

The following tables will show the total cost of cultivation and seeding. Table No. 1 for present year, table No. 2 for years of normal fodder values:—

TABLE No. 1.

COST OF PRODUCTION OF SEED WHEAT, WITH MARKET VALUES OF FEED AT DATE OF OPERATIONS.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff. (s. d.)	Value per Ton of Oaten and Lucerne Chaff Mixed. (s. d.)	Value per bushel Crushed Oat Seconds. (s. d.)	Value per Ton Beet Sugar Molasses. (s. d.)	Ration Feed to each Horse per Day—Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day. (s. d.)	Total Cost of Ration per Day per Team. (s. d.)	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation. (£ s. d.)	No. of Days of Labour Paid.	Rate per Day of Labour Paid. (s. d.)	Total Cost of Labour for Operation. (£ s. d.)	Cost of Oil and Repairs. (s. d.)	10% Depreciation on Value of Implements. (s. d.)	10% Depreciation on Value of Horses. (s. d.)	5% Interest on Value of Implements. (s. d.)	5% Interest on Value of Horses. (s. d.)	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation. (s. d.)	Total Cost of each Operation. (£ s. d.)
Ploughing ..	1914. June 26th 18th Aug.	50 0	..	2 0	..	Oaten Chaff 38 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	54	10 1 0	92	8 0	36 16 0	70 0	13 9	138 0	6 10½	69 0	345	3¾	5 3¼	91 14 7¼
Double Harrowing	19th Aug. 3rd Sept.	50 0	..	2 0	..	Oaten chaff, 38 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	16	11 17 4	26	8 0	10 8 0	12 0	2 6	35 0	1 0	17 6	345	26¼	0 8 9/10	25 13 4
Harrowing	24th Sept. 11th Oct.	..	70 0	2 3	30 0	Oaten and Lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet Molasses, 2 lbs.	6	1 1¾	6 10½	18	5 17 0½	10	8 0	5 8 0	6 0	1 2	19 8	0 7	9 10	345	24¼	0 9 1/10	13 9 6
Harrowing	28th Nov. 12th Dec.	..	90 0	2 6	30 0	„ „	6	1 5¼	8 7¼	15	6 9 4	4 / 13	7 0 / 7 0	4 11 0	6 2	1 0	16 5	0 6	8 2¼	345	26¼	0 8¾	12 12 7½
Spike rolling and Harrowing	29th Dec. 1915. 26th Jan.	..	110 0	3 6	30 0	„ „	6	1 9	10 6	30	15 15 0	26	7 0	9 2 0	15 0	4 11	32 10	2 5½	16 5	345	13¼	1 7¾	28 8 7½
Cultivation, 3½" deep	26th Jan. 27th Feb.	..	140 0	4 0	30 0	„ „	5	2 2¼	10 11¾	49	26 15 11	44	7 0	15 8 0	22 0	10 9	45 8	5 4½	22 10	345	7½	2 9	47 10 6¼
Harrowing before drilling	17th April 3rd May	..	180 0	5 0	30 0	„ „	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3¾	22 8 9
Drilling ..	17th April 3rd May	..	180 0	5 0	30 0	„ „	8	2 10	22 8	13½	15 6 0	23	7 0	8 1 0	9 0	6 1	20 8	3 0½	10 4	345	15	1 5¾	25 16 1½
Harrowing after drilling	17th April 3rd May	..	180 0	5 0	30 0	„ „	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3¾	22 8 9
Seeding ..	17th April 3rd May	Total graded seed wheat sown, 356½ bushels, at 9s. per bushel = 62 lbs. sown per acre. Cost per acre and total cost of seed wheat ..																			..	9 3¾	160 8 6
Manuring ..	17th April 3rd May	Total superphosphate, 36–38% Sol., 16½ tons, at £4 5s. per ton = 107 lbs. sown per acre. Cost per acre and total cost of manure																			..	4 0¾	70 2 6
		Rent of land, 12s. per acre, for eighteen months. Total cost per acre, £1 10s. 2½d. Total cost, 345 acres, to date .. .. .. To be added after harvest = £207 + £4 11s. 6d., temporary improvements.																			..	..	520 13 10¼

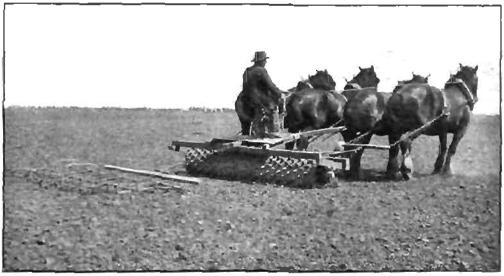
Notes on Table No. 1.

POINTS OF INTEREST TO FARMERS.

In submitting the foregoing table, the exact costs have been recorded during the dates of each operation.

MARKET VALUES OF FODDERS.

It will be noticed that actual values on the farm of all horse feed used have been charged in accordance with the varied fluctuations of the market during the present season. The molasses used is the only exception to this rule. Beet sugar molasses was purchased in bulk two years ago, and as varying market values of this food are hard to determine, we have, therefore, charged molasses at £1 10s. per ton. The prices of chaff ranged from £2 10s. to £9 per ton, and crushed oat seconds from 2s. to 5s. per bushel during the period 26th June, 1914, to 3rd May, 1915.



Summer Cultivation of Fallow.

RATION FED TO HORSES.

A perusal of Table No. 1 will show that the horses consumed—

38 lbs. oaten chaff } per day.
7 lb. crushed oat seconds }

during ploughing and immediate harrowing operations, from 26th June to 3rd September, 1914. The value on the farm of this oaten chaff and crushed oat seconds was 50s. per ton and 2s. per bushel respectively. This ration worked out at 1s. 2¾d. per horse per day.

In calculating the cost of each separate cultivation, the horse feed consumed during the days that the horses were idle (Sundays and holidays) has been charged to the operation as well as the feed used during the working days.

Thus it will be seen that in the ploughing season forty-six working days and eight idle days, totalling 54 in all, have been charged for in calculating the cost of ploughing. The same applies in every case that days were lost through wet weather, Sundays, and holidays.

VALUE OF LUCERNE CHAFF IN RATION.

A change of food was given during the rest of the cultivation and seeding operations, and the average ration fed to each horse during the dates 24th September, 1914, to 3rd May, 1915, was—

Oaten and lucerne chaff, mixed in equal proportions, 31 lbs.
Crushed oat seconds, 2½ lbs.
Beet-sugar molasses, 2 lbs.

This, then, is a comparatively cheaper ration than the first ration fed of 38 lbs. oaten chaff and 7 lbs. crushed oat seconds, and apparently the horses did as well in each case. These rations represent the actual food that the horses ate, and they were given as much as they would eat four times a day.

VARYING COSTS OF RATIONS.

A great difference will be noticed in the cost of the ration per horse varying with the market value of the fodder consumed. During 24th September-11th October, 1914, with oaten and lucerne chaff mixed at £3 10s. per ton, crushed oat seconds at 2s. 3d. per bushel, and molasses at 30s. per ton the horses only cost to feed 1s. 1¾d. each per day, while seven months later, with chaff valued at £9 per ton, crushed oats at 5s. per bushel, and molasses at 30s. per ton, the cost of the ration was 2s. 10d. per horse per day.

THE SEPARATE CULTIVATIONS.

Ploughing, four inches deep, at the average rate of 3¾ acres per day, was completed this season at a cost of 5s. 3 4-5d. per acre. This average was maintained after calculating in the four working days lost as holidays and wet weather. One four-furrow stump-jump mouldboard plow and one four-furrow disc plow each took part in the fallowing. There seemed to be little difference in the comparative efficiency of those two implements. The cost of maintenance of the plough shares on the mouldboard plough was greater than the wear and tear in the case of the disc plough, but the area covered in the case of the former was slightly in excess of the work done by the latter, owing to the 4 inches extra width covered by the mouldboard plough. The quality of the work and the lightness of draught with these ploughs seemed this season to share equal honours.

Harrowing was done with a team of six horses attached to a set of six heavy harrows at the rate of from 23 to 26½ acres per day, and at a cost ranging from 9d. to 1s. 3 3-5d. per acre—9d. when the horse feed was cheap and 1s. 3-35d. per acre when the price of fodder was dear.

Cultivation was done with a 7-ft. cultivator (Massey Harris spring tooth) to a depth of 3½ inches at 2s. 9d. per acre, with chaff at £7 per ton and crushed oat seconds at 4s. per bushel. The average area covered per day was approximately 8 acres.

DRILLING.

Two 17-hoe disc drills were used and averaged 15 acres per day, at a cost of 1s. 5 2-5d. per acre, with chaff at £9 per ton and oats at 5s. per bushel.

TILTH OF LAND.

After these ten cultural operations the land was left in an excellent condition: the whole were absolutely necessary probably because of the

dry season experienced during fallowing, and the comparative virgin nature of the land.

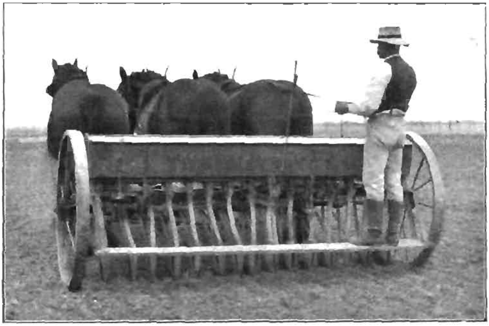
SINKING FUND INTEREST, OIL, AND REPAIRS.

Fifteen per cent. Sinking Fund and interest have been calculated and allowed on the total capital value of the whole of the implements and horses used on each cultivation. The cost of shares, repairs, and oils have also been allowed for.

SEED, MANURE, RENT, AND TEMPORARY IMPROVEMENTS.

The price of seed wheat has been charged at 9s. per bushel, 62 lbs. per acre on the average being shown.

Superphosphate 36-38 per cent. Sol. was applied at the rate of 107 lbs. per acre. Value, £4 5s. per ton



Sowing the Seed with a Disc Drill, Research Farm, Werribee.

The rent on the land is £207, and the temporary improvements erected at the outset of the work, £4 11s. 6d., have been held over from the total cost until the balance-sheet is prepared after the completion of the harvesting of this field.

COSTS.

The cost, then, after allowing for cultivation, seed, and manure, £1 10s. 2¼d. per acre, and the total cost of the 345 acres sown this season, is £520 13s. 10½d.

Notes on Table No. 2.

This table has been calculated to show the cost that would be incurred in years of normal fodder and seed values. All other calculations are taken from table No. 1, and based on the facts gathered from the field of 345 acres sown this season.

TABLE NO. 2.

COST OF PRODUCTION OF SEED WHEAT, WITH AVERAGE MARKET VALUES FOR FEED ON FARM.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff.	Value per Ton of Oaten and Lucerne Chaff Mixed.	Value per Bushel Crushed Oat Seconds.	Value per Ton Beet Sugar Molasses.	Ration Fed to each Horse per Day Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day.	Total Cost of Ration per Day per Team.	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation.	No. of Days of Labour Paid.	Rate per Day of Labour Paid.	Total Cost of Labour for Operation.	Cost of Oil and Repairs.	10% Depreciation on Value of Implements.	10% Depreciation on Value of Horses.	5% Interest on Value of Horses.	5% Interest on Value of Implements.	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation.	Total Cost of each Operation.
	1914.	s. d.	s. d.	s. d.	s. d.			s. d.	s. d.	s. d.	£ s. d.		s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.			s. d.	£ s. d.
Ploughing..	26th June 18th Aug.	55 0	..	1 9	..	Oaten chaff, 38 lbs. Oats, seconds, 7 lb.	12	1 3	15 0	54	40 10 0	92	8 0	36 16 0	70 0	13 0	138 0	69 0	6 10½	345	3¾	5 4	92 3 7½
Double harrowing	19th Aug. 3rd Sept.	55 0	..	1 9	..	.. ..	12	1 3	15 0	16	12 0 0	26	8 0	10 8 0	12 6	2 0	35 0	17 6	1 0	345	26½	0 9	25 16 0
Harrowing..	24th Sept. 11th Oct.	..	60 0	1 9	30 0	Oaten and lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet molasses, 2 lbs.	6	0 11½	5 9	18	5 3 6	10 4	8 0 7 0	5 8 0	6 6	1 2	19 8	9 10	0 7	345	24½	0 8¾	12 9 3
Harrowing..	28th Nov. 12th Dec.	..	60 0	1 9	30 0	.. ..	6	0 11½	5 9	15	4 6 3	13	7 0	4 11 0	6 2	1 0	16 5	8 2½	0 6	345	26½	7¼	10 9 6½
Spike rolling and harrowing	29th Dec. 1915. 26th Jan.	..	60 0	1 9	30 0	.. ..	6	0 11½	5 9	30	8 12 6	26	7 0	9 2 0	15 0	4 11	32 10	16 5	2 5½	345	13¼	1 2¾	21 6 1½
Cultivation, 3½" deep	26th Jan. 27th Feb.	..	60 0	1 9	30 0	.. ..	5	0 11½	4 9½	49	11 14 9½	44	7 0	15 8 0	22 0	10 9	45 8	22 10	5 4½	345	7¼	1 10½	32 9 5
Harrowing before drilling	17th April 3rd May	..	60 0	1 9	30 0	.. ..	6	0 11½	5 9	18	5 3 6	15	7 0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Drilling ..	20th April 3rd May	..	60 0	1 9	30 0	.. ..	8	0 11½	7 8	13½	5 3 6	23	7 0	8 1 0	9 0	6 1	20 8	10 4	3 0½	345	15	11	16 13 7½
Harrowing after drilling	17th April 3rd May	..	60 0	1 9	30 0	.. ..	6	0 11½	5 9	18	5 3 6	15	7 0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Seeding ..	17th April 3rd May	*Total graded seed wheat sown, 356½ bushels, at 5s. 6d. = 62 lbs. per acre. Cost per acre and total cost of seed wheat* ..																			..	5 8½	98 0 9
Manuring ..	17th April 3rd May	Total superphosphate, 36-38 % sol. sown, 16½ tons, at £45 per ton = 107 lbs. per acre. Cost per acre and total cost of manure																			..	4 0¾	70 2 6
		Rent on land, 12s. per acre, for eighteen months. Total cost per acre, £1 3s. 4½d. Total cost, 345 acres to date .. To be added after harvest = £207 + £4 11s. 6d., temporary improvements.																				..	403 3 4

NORMAL FODDER VALUES.

Oaten chaff has been valued at £2 15s. per ton on the farm, exclusive of bags.

Oaten and lucerne chaff mixed has been valued at £3 per ton on the farm, exclusive of bags.

Crushed oat seconds has been valued at 1s. 9d. per bushel on farm, while beet sugar molasses has been valued at £1 10s. per ton on farm throughout the fallowing, cultivation, and seeding operations.

Graded seed wheat sown is valued at 5s. 6d. per bushel, and superphosphate at £4 5s. per ton.

The cultural operations, with these average prices of food, have been worked out at:—

s.	d.	
5	4	per acre for *Ploughing*
0	8½	per acre for *Harrowing*
1	10½	per acre for *Cultivation.*
0	11	per acre for *Drilling.*

If, however, a damper fallowing season had been experienced the ten cultural operations which were necessary to ensure good tilth this season would not have all been necessary, but the days lost through wet conditions would probably have been increased during the ploughing season, and thereby add to the spearate costs of the cultivations necessary under these altered conditions.

COSTS WITH FODDER AT STANDARD VALUES

With these standard values, then, the cost has worked out at £1 3s. 4½d. per acre, and the total cost of the 345 acres at end of seeding shows an expenditure of £403 3s. 4d., or 6s. 9¾d. less per acre than it has cost during the present season with fodder values very high.

BAYONET GRASS, ETC.

While in the Benalla district this week I was much impressed by the value of the plant known by various names in different districts as bayonet grass, sword grass, and spear grass, for fodder purposes.

In its natural state stock will not eat it, but when grubbed out below the bulbs they will thrive upon the lower portions, and both cattle and sheep are being fed in this way in large numbers at present, while, at the same time, the grass is being cleared out.

Some farmers state that their stock thrive better on this fodder than when hand-fed on hay, chaff, &c.

There are many thousands of acres on which this plant grows, and there must be hundreds of men who do not know its value, and who should be glad to hear that it can be put to such a useful purpose, and may be the means of saving hundreds of cattle and sheep during the next three months.—[TEMPLE A. J. SMITH, *Chief Field Officer, Agricultural Department.*]

ECONOMICAL FEEDING OF STOCK.

FACTS IN FEEDING HORSES.

By J. W. Paterson, B.Sc., Ph. D. (Professor of Agriculture, University of Western Australia).

A horse requires food if it is not working; this food may be considered as maintenance. If it is working it requires food in excess of this, and the excess may be considered as fuel. If a steam-engine is to do a certain amount of work it requires a certain amount of fuel, and the same is true of a horse. A steam-engine can use only about 7 per cent. of the energy contained in the fuel, whilst a horse can use 31 per cent. The fuel of the engine is wood or coal, and the fuel of the horse is the digested, assimilated food. Various things have to be looked to in a food, viz.:—

(1) Composition.
(2) Digestibility.
(3) Energy spent in digesting it.

COMPOSITION.

Green foods contain about 75 per cent. of water, and this leaves less room for the nutritive materials or dry matter in a ton of food. If well made, the dry matter in hay is as good as in the green material, and there is from three to four times more in a ton of it. The useful materials in the dry matter are the proteins, fats, and carbo-hydrates, all of which are available as animal fuels. The cereal grains supply much carbo-hydrates (starch, &c.), as also do beans and peas, but the latter are much richer in proteins. Oats and maize contain 5 or 6 per cent. of fats, while wheat and barley contain very little. As food to a horse, proteins are 1¼ times better fuel than starch, and fats are nearly 2½ times better. Foods always contain fibre, and whilst herbivorous animals, like the horse, require some fibre, an excess diminishes the value of the food. The proteins, fats, and carbo-hydrates of foods are each of them groups of substances, and chemical analysis should be used only to compare foods of the same class. It is wrong to compare, say, lucerne hay with maize on the basis of its analysis, because in lucerne the fats and carbo-hydrate groups are differently made up and show a wide difference in their digestibility.

DIGESTIBILITY.

Concentrated foods like grain and cakes are more thoroughly digested than coarse fodders like bran, hay, or straw. From careful experiments it has been found that a certain percentage only of each constituent of each food is digested, and what is not digested is of no use. Of wheat and maize almost 90 per cent. is digested; of linseed cake, 80 per cent.; oats, 70 per cent.; bran and lucerne, 60 per cent.; and wheat straw, about 40 per cent. The digestibility of hay is seriously injured by ripening before cutting, in some cases being reduced from 65 per cent. to 48 per cent. According to recent investigations at the Roseworthy (S.A.) College by Professor Perkins, the best time to cut wheaten hay is three weeks after full bloom, when the grain is about to leave the milky stage and become doughy, but some farmers think this is too late. Knowing the composition of any food, and the digestibility of its

various constituents, the percentage of digestible proteins, fats, and carbo-hydrates which it contains can be easily calculated.

ENERGY EXPENDED IN DIGESTION.

Until quite recently it was believed that when one had found the percentage of digestible constituents in a food, the information as to its value was complete. This is wrong, and another very important item must be considered. A deduction must always be made from the value of the food digested on account of the energy which is spent in effecting the digestion. The amount to be so deducted depends upon the class of foods. It is greatest with the fibrous or coarse fodders. Thus, with maize or wheat, about 10 per cent. of the energy of the food digested is spent in digesting it; with linseed cake, 18 per cent.; oats, 20 per cent.; bran, 23 per cent.; lucerne hay, 48 per cent.; and poor wheat straw, 168 per cent. An animal restricted to straw of that class would obviously die. The energy spent on digestion, being spent inside the animal, will help to maintain its temperature, but it cannot be used again to pull a plough or a dray. The value of a horse feed, therefore, depends upon the amount of digested fuel, but minus the fuel spent in digesting the digested fuel. This is the net amount available for doing work. Considered in this way, 100 lbs. of maize, 106 lbs. of wheat, 113 lbs. of linseed cake, 144 lbs. of oats, 166 lbs. of bran, 288 lbs. of lucerne hay, have each of them the same value in enabling a horse to perform work.

The food required to keep an idle horse living is often termed its maintenance diet. Fibrous foods are all right for a maintenance diet, as the energy spent in digesting them helps to keep up the body temperature. About 10 lbs. daily of good lucerne hay and 5 lbs. of straw can keep a horse of 1,100 lbs. at constant weight under favorable conditions. If put to work, however, the ration must be immediately improved by an addition of cheaply digested foods which offer a big surplus of energy after their own digestion is accomplished. Straw, *lucerne, and bran are thus cheap maintenance foods, but are not cheap foods for topping up the maintenance diet when a horse is required to do work.*

AMOUNT OF FOOD.

Work is measured by foot-pounds. At ordinary work a horse does about ten million foot-pounds per day, and at hard work fifteen million foot-pounds. One pound of digested assimilated starch, or its equivalent, supplies energy for nearly one and three-quarter million foot-pounds and thus for ordinary work about 6 lbs. of digested assimilated starch or its equivalent, and for hard work 9½ lbs. are required. The latter could be supplied by 17 lbs. of oats, or 13 lbs. of an equal mixture of oats and maize, or 19 lbs. of an equal mixture of oats and bran. These foods will be in addition to the hay and large foods required for maintenance.

ALBUMINOID RATION.

The chief thing to attend to in a labour ration is to supply sufficient digested food in the form of starch or its equivalent. It is now known that work does not require a ration rich in protein (albuminoids). "Albuminoid ratio" means the ratio of the digested proteins to the digested non-proteins in the food reckoned as starch. A ratio of 1 : 7

would be ample for draught horses, and a diet of oats and good hay is easily within the limit. A ration containing all its grain, as maize, would be risky, if the hay were poor, and the addition of molasses would make it worse. With these exceptions it is unnecessary to trouble about an "albuminoid ratio." Fast horses require a rather higher proportion of albuminoids (proteins) than draughts, and for these maize should only be used in small quantities

Mixing Food.

The proteins of each kind of plants are built up of certain simpler bodies called amino-acids, just as a house is built up of bricks. It is always safer, and usually more economical, in feeding farm stock to use a mixture of foods derived from different plants. By doing so, a lack, or deficiency, of some of these simpler bodies in the proteins of one plant may be made up by a surplus in the proteins of another. On this account bran or wheat go better with oaten than with wheaten hay, and maize goes well with either. Taken by themselves, oats make the best corn for horses, but not the most economical. The following

Daily Rations

are suggested in the latest issue of the *Journal of the Board of Agriculture* (England), and may be reproduced:—(*a*) Draught horses: Ration 1, 18 lbs. of hay, 14 lbs. of oats, cost 1s. 8d.; ration 2, 18 lbs. of hay, 6 lbs. dried grains, 2 lbs. pollard, 4 lbs. bran, 2 lbs. maize, cost 1s. 2d. (*b*) Light-legged horses: Ration 1, 10 lbs. hay, 16 lbs. oats, cost 1s. 7d.; ration 2, 10 lbs. hay, 6 lbs. oats, 2 lbs. beans, 5 lbs. dried grains, 2 lbs. bran, cost 1s. 3d. Smaller horses require less. The hay referred to in these tables is presumably grass or clover hay, but the difference between that and good cereal hay need hardly be considered for local practice. In considering the value of a food, suitable composition, digestibility, and cost of digesting are not everything. Palatability, regular feeding, and general good management are essential to success.

FERTILIZERS IN JAPAN.

The amount of artificial fertilizers imported into Japan during 1913 was 10 per cent. of the total imports.

Over 7¼ million pounds worth of various artificial fertilizers were imported. According to a British consular report a certain amount of the manure was used for mulberry trees, but most of it is used for food crops, especially rice.

The item of greatest interest is sulphate of ammonia, 110,635 tons, valued at £1,643,600—approximately 25 per cent. increase from the preceding year. Nearly the whole of this came from the United Kingdom, while a small amount, valued at £25,000, came from Australia.

To producers of sulphate of ammonia it will be of interest to note that a Mond gas plant is being installed at the Fustun coal mines in Manchuria. This plant has been specially designed for the recovery of sulphate of ammonia, as it has been discovered that Fustun coal is particularly suitable for this purpose, and it is estimated that 250 tons of coal will be gasified per day, giving a daily yield of 12 tons of ammonium sulphate.—[Extract from *Fertilizers*, 3rd October, 1914.]

RESULTS OF LUCERNE TESTS SEASON 1914-15.

CENTRAL RESEARCH FARM, WERRIBEE.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

THE DRY SEASON.

The past season has severely tried all those engaged in agricultural pursuits in Southern Australia. The agriculturist has not only had to suffer the partial, or complete failure of his wheat and hay crops through drought, but his resources have been taxed to the utmost to keep his sheep and cattle alive, and his horses in working condition.

Hay and straw stacks, accumulated during years of plenty, have, owing to failure of grass, literally melted away before the requirements of live stock, and prices of these commodities have soared to famine levels. As a consequence, foods which, in normal years are rarely fed to stock, *e.g.*, onions, sugar-beet, and potatoes, have been used to supplement the scanty supplies of hay and straw.

The drought has been weathered, and the losses of stock in the State, as revealed by the figures issued by the Government Statist, are not as heavy as one might perhaps have expected. Nevertheless, the losses are sufficient to impress on the community the need for protection against future dry spells, and the imperative necessity for increasing water storage and irrigation settlements of the State.

With the extension of irrigation, greater attention will be paid to the production and conservation of fodder crops, and loss of stock which is the worst feature of periodic droughts will, to a very large extent, be mitigated.

Of all the forage crops that can be grown under irrigation it is questionable whether any can approach, much less surpass, irrigated lucerne, in general utility.

Advantages of Lucerne.

In growing forages on an irrigation farm the farmer must necessarily be guided in his choice by the cost of production, and the yield per acre. From irrigated lucerne he may confidently expect five cuttings in a season, and the effective life of the plant varies from seven to fifteen years, according to the manner in which it is treated. Consequently the annual expense of preparing the seed bed, purchasing and sowing the seed, is eliminated (an important feature on an irrigated holding), and this makes the cost of production relatively low. But, low though its annual cost is, it is nevertheless a most prolific yielder, as we hope to show in the sequel.

Two further advantages accrue from the cultivation of lucerne:—

(1) It possesses a high percentage of protein—the most valuable and expensive ingredient in foodstuffs, and this enables the farmer to provide a balanced ration on the farm, without having to purchase nitrogenous concentrates like bran. The hay is appreciated by all kinds of live stock, and those, who, by force of circumstances, have this year used it for the first time, have probably been surprised at the feeding value of well-cured lucerne hay.

(2) Finally, lucerne is the greatest soil renovator known to agriculture. Its immense root system exerts a remarkable subsoiling effect on the lower layers, brings up mineral plant food from great depths, and also accumulates nitrogen from the air, and fixes it and increases the soil fertility.

Optimum Conditions for Lucerne.

Lucerne is certainly a prolific yielder of forage, but it gives best yields only when the soil and climatic conditions are thoroughly satisfactory. Every cultivated plant, must, of course, have certain optimum soil conditions to give maximum growth. These soil conditions vary with the nature of the plant. Rice requires an abundance of water in the soil, verging on saturation. Wheat, on the other hand, does best with a soil at 40-45 per cent of its water-holding capacity. What are the most favorable soil conditions for obtaining heavy cuts of lucerne? They may be divided under three heads:—

(1) Water requirements.
(2) Plant food requirements.
(3) Cultivation requirements.

These have been the subject of experimental investigations at the Central Research Farm, Werribee. Let us consider the results seriatim:—

(1) WATER REQUIREMENTS OF THE LUCERNE CROPS.

Lucerne, in common with all other forage plants, requires large quantities of water to make full growth and development. Water acts as a vehicle, conveying in solution, from root to stem and leaf, the mineral matter necessary for building up new tissues. For every pound of new tissue elaborated a certain definite quantity of water must pass through the plant, and evaporate from the leaves. Let us see how much water must be transpired in order to build up, say, 1 ton of dry lucerne hay. The importance and value of such information is obvious: for if we can determine how much water is required to produce a ton of lucerne hay, we may estimate the maximum amount of forage that can be grown under a given rainfall; the amount of irrigation water that must supplement the rainfall to produce a definite quantity of forage, as well as the most effective applications of irrigation water at the varying seasons of the year.

How to Measure the Water Requirements of Lucerne.

So far as is known, the exact measurement of the water requirements of our various farm crops has not hitherto been attempted in Australia. A short description of the methods adopted for estimating the water requirements of typical farm crops may therefore be of interest.

The amount of water required for lucerne can be determined with considerable accuracy. Consider a crop growing under ordinary field conditions. The water that falls on the soil as rain may disappear from the soil in three ways:—

(*a*) Pass by percolation into the subsoil beyond the reach of the roots.
(*b*) Evaporate from the surface of the soil.
(*c*) Pass into the roots of the growing crop, and out as water vapour through the leaves.

If the measurement of water requirements is conducted under ordinary field conditions it is impossible to eliminate the first source of loss, except by growing the crops in specially-constructed drain gauges. If, however, the crop is grown in large pots, the loss by percolation is absolutely cut off, and only two sources of loss of soil water remain, namely—

(*a*) Evaporation from the soil.
(*b*) Transpiration through the crop.

Further, if a control-pot is taken, in which no crop is grown, there obviously is only one source of loss. An accurate method of studying the actual quantity of water required by lucerne is to have a series of pots of uniform size and weight, filled with soil under uniform conditions, and sow lucerne in one half the pots, and allow the other half to lie under bare fallow. The pots growing the lucerne lose water—

(*a*) By transpiration through the crop.
(*b*) By evaporation from the soil surface.

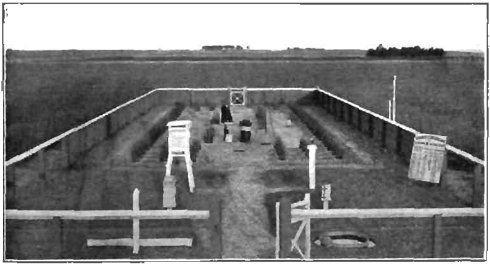


Fig. 1.—General view of Pot Enclosure, Werribee, used for the determination of the water requirements of plants. The pots are kept at ground level in order to prevent fluctuations in temperature. In the foreground is meterological apparatus for recording (*a*) air and soil temperatures; (*b*) hours of bright sunshine; (*c*) humidity; (*d*) rate of evaporation.

The pots under bare fallow lose water by evaporation only. The difference between the weights of the two series of pots at any given time will give the amount of water transpired by the lucerne.

The pots in which the experiment was conducted were 16.32 inches in diameter, and 27 inches deep, and contained 280 lbs. of moist soil. In order to reduce the evaporation to a minimum the soil was covered with 2 inches of gravel. The pots were kept at the same temperature as the soil, in the open, and, as far as possible, under actual field conditions. The amount of water falling on the pots was determined by two rain gauges, and by two specially-constructed water measurers (fig. 1), exactly the same diameter as the pots. The amount of water which fell on the water-collectors was measured in cubic centimetres, and the amount checked against the quantity in the rain gauges.

To determine the water requirements of lucerne four pots were used, two of which were kept as controls under bare fallow, and two were

sown with Hunter River lucerne. The pots were weighed weekly throughout the year (fig. 4) on a specially-constructed steelyard, capable of measuring a load of 300 lbs., and turning to less than 1/10th of a pound.

As each crop of lucerne matured it was carefully harvested, and the dry matter in each cut determined in the laboratory.

In spring and summer the lucerne required to be watered in order to maintain full growth, such watering was effected through specially-constructed tubes running to the bottom of the pots.

The whole series of pots was brought to constant weight once weekly by the addition of water lost during the preceding week. As the moisture concentration in all pots was thus maintained fairly constant the rate of evaporation from the soil was uniform in all the pots. The gravel mulch was kept well stirred to reduce water losses to a minimum.

Expressing the Results.

The most satisfactory method of expressing the water requirement is to refer to the amount of water required to produce a definite quantity, say, 1 ton, of dry matter of the particular crop. This quantity is called the *Transpiration Ratio*, and for any given crop is fairly constant.

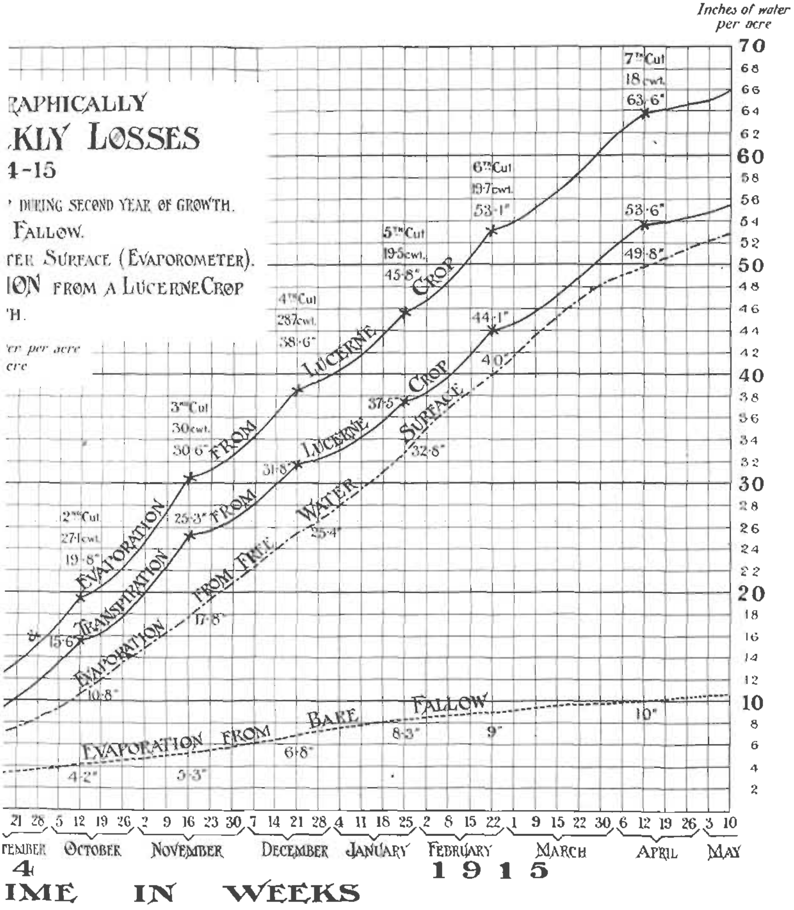
We will consider, first, the total monthly losses of water from the crop and soil combined, and from the crop alone, throughout the year, secondly, amount of water required to produce a fixed tonnage of lucerne, expressed in inches of rain, and, finally, endeavour to trace a relationship between the transpiration of the crop, and the evaporation from a free water surface. Table I. gives the total monthly losses of water from pots 1 and 8, under bare fallow, representing evaporation from soil only; and pots 3 and 7 under lucerne, and representing combined losses by evaporation and transpiration.

TABLE I.—*Showing monthly losses by Evaporation from pots under Bare Fallow, and by Evaporation and Transpiration, combined from pots under Lucerne; also the losses by Transpiration only (in pounds of water)*

(Size of pots 16·32" in diameter = $\frac{1}{30000}$ acre.)

No. of Pot.	Treatment.	May, 10-31	June 1914.	July, 1914	Aug 1914.	Sep. 1914.	Oct. 1914.	Nov. 1914.	Dec. 1914.	Jan. 1915.	Feb. 1915.	Mar. 1915	Apl 1915.	May 6th, 1915.	Total for Year
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	**Bare fallow** ..	4.1	7·2	4·8	5·3	6·8	5·9	10·4	9·8	9·5	5·2	5·0	5·1	·76	**79·9**
8	**Bare fallow** (duplicate)	4·4	7·0	6·0	6·0	8·0	5·9	10·7	12·0	9·9	5·5	5·0	5·6	·96	**86·0**
3	**Lucerne**—														
	(1) Loss by evaporation and transpiration	8·3	23·2	12·2	25·3	46·5	53·8	75·5	54·7	56·2	52·5	49·8	35·5	5·60	**499·1**
	(2) Loss by transpiration	4·1	16·2	6·8	19·2	39·1	48·6	64·0	43·8	46·5	47·2	44·8	30·2	4·7	**414·6**
7	**Lucerne** (duplicate)														
	(1) Loss by evaporation and transpiration combined	7·9	21·8	13·5	26·1	49·6	60·4	82·2	61·0	58·8	57·1	62·7	39·3	6·4	**546·6**
	(2) Loss by transpiration	3·7	14·8	8·1	20·0	42·2	54 6	71·5	50·1	49 1	51·8	57·7	34·0	5·5	**463.1**

This table will be more intelligible if the figures, representing the losses, are converted into the equivalent of inches of rain per acre.



Inches of water per acre
RAPHICALLY
KLY LOSSES
4-15
DURING SECOND YEAR OF GROWTH.
FALLOW.
TER SURFACE (EVAPOROMETER).
ION FROM A LUCERNE CROP
TH.
er per acre
cre
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
7th Cut
18 cwt.
63·6"
6th Cut
19·7 cwt.
53·1"
5th Cut
19·5 cwt.
45·8"
4th Cut
28·7 cwt.
38·6"
3rd Cut
30 cwt.
30·6"
2nd Cut
27·1 cwt.
19·8"
53·6"
49·8"
44·1"
40·0"
37·5"
32·8"
31·8"
25·3"
25·4"
17·8"
15·6"
10·8"
10"
9"
8·3"
6·8"
5·3"
4·2"
EVAPORATION FROM LUCERNE CROP
TRANSPIRATION FROM LUCERNE CROP
EVAPORATION FROM FREE WATER SURFACE
EVAPORATION FROM BARE FALLOW
21 28 5 12 19 26 2 9 16 23 30 7 14 21 28 4 11 18 25 2 8 15 22 1 9 15 22 30 6 12 19 26 3 10
TEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
4
1915
IME IN WEEKS

TABLE II.—*Showing the monthly losses from a Bare Fallow and Lucerne crop, expressed in the form of Inches of Rain. The monthly evaporation from a free water surface is included for purposes of comparison. (Figures represent inches of rain per acre.)*

Pot.	Treatment.	May 10-31	June 1914.	July. 1914.	Aug. 1914.	Sep. 1914.	Oct. 1914.	Nov. 1914.	Dec 1914.	Jan. 1915.	Feb. 1915.	Mar. 1915.	Apl. 1915.	May 10 days 1915.	Total for Year.
		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
1	**Bare fallow** ..	·55	·96	·64	·71	·91	·79	1·39	1·31	1·27	·69	·66	·68	·10	**10·66**
8	**Bare fallow** ..	·50	·93	·80	·80	1·06	·79	1.43	1·60	1·32	·73	·66	·75	·13	**11·59**
3	**Lucerne**—														
	(1) Loss by transpiration and evaporation	1·10	3·15	1·75	3·38	6·20	7·16	10·07	7·30	7·50	7·00	6.64	4·73	.75	**66.68**
	(2) Loss by transpiration	·55	2·15	1·64	2·56	5.21	6.40	8·53	5·84	6·20	6·30	5·97	4·02	·60	**55.9**
7	**Lucerne**—														
	(1) Loss by transpiration and evaporation	1.05	2·90	1·80	3·48	6·61	8·05	10·93	8·13	7·84	7·61	8·26	5·24	·85	**72.85**
	(2) Loss by transpiration	·49	1·98	1·08	2·66	5·63	7·28	9·53	6·68	6·55	6·91	7·69	4·53	·75	**61.76**
—	Evaporation from a *free water surface*	·73	1·20	·82	2·70	2·90	5·20	6·60	5·60	8·56	6·60	6.50	4·00	1·01	**52·36**

The results may even be more clearly expressed by reducing them to graphical form, and plotting the period of growth horizontally, and the water requirements vertically.

In order to bring out the differences, as well as the relationships of these figures, the cumulative weekly losses from Lucerne, Barefallow, and Evaporation from a free-water surface throughout the whole year, are given in graphical form in the foregoing chart.

CHART.—*Shows the Cumulative Weekly Losses (expresed in inches of rain per acre) throughout the entire season from plots treated as Bare Fallow, and with Growing Lucerne; also losses by Evaporation from a Free-water Surface for the same period.*

This chart summarizes, in a graphical manner, the seasonal water requirements for a crop of lucerne in its second year of growth.

It will be noted that, after each cut, the curve of transpiration flattens, representing diminished water requirements of the young lucerne. As the lucerne develops, the curve of transpiration becomes steeper and steeper, reaching a maximum immediately before cutting.

The curve representing the evaporation from a free-water surface is plotted to the same scale, and it will be noted that the crop throughout the year transpired more water than is lost by evaporation from a free-water surface. That is to say, an acre of lucerne in full growth will evaporate more water through its leaves than the amount that would be evaporated in a year from an acre of standing water, with the hot winds and sun constantly playing on it.

From the graph it will be seen that the seven cuts required no less than 54 inches of water per acre to pass through the crop.

During the same period the soil, though well mulched, lost 10 inches of water by evaporation, consequently the total loss from the crop and the soil was 64 inches.

Throughout the whole year the amount of dry matter produced by the lucerne was 8 tons per acre, consequently the crop required 8 inches

of water to produce 1 ton of dry matter, and of this approximately 6¾ inches passed through the lucerne crop, and 1¼ inches was dissipated from the soil by evaporation.

The following table gives further details as to the weight of dry matter, and quantities of water used:—

TABLE III.—*Showing Number of Cuttings, Weight of Dry Matter, and Amount of Water required for production of 1 ton dry matter for Lucerne Crop, during second season of growth, Werribee,* 1914-15.

No. of Pot.	Date of Cutting.	Weight of Dry Matter in Grams.	Calculated Weight per Acre.	Water used in Inches per Acre for Seven Cuts.	Transpiration Ratio—Tons of water required for Production of 1 Ton Dry Matter.
		Grams per Pot.	Cwt. per Acre.	Acre Inches.	Tons
Pot 3 ..	1st, 13th July, 1914 ..	29·2	17·1		
	2nd, 12th Oct., 1914 ..	47·02	27·1		
	3rd, 16th Nov., 1914 ..	50·25	30·0		
	4th, 21st Dec., 1914 ..	48·0	28·7	54·0	675
	5th, 25th Jan., 1915 ..	32·97	19·5		
	6th, 22nd Feb., 1915 ..	33·4	19·7		
	7th, 15th April, 1915 ..	30·25	18·0		
		271·09	160·1		
Pot 7 .. (Duplicate)	1st, 13th July, 1914 ..	31·2	18·5		
	2nd, 12th Oct., 1914 ..	53·2	31·2		
	3rd, 16th Nov., 1914 ..	53·25	31·5		
	4th, 21st Dec., 1914 ..	54·2	32·4	60·9	687
	5th, 25th Jan., 1915 ..	31·2	18·5		
	6th, 22nd Feb., 1915 ..	35·4	21·1		
	7th, 15th April, 1915 ..	39·0	23·3		
		297·45	176·5		

When expressed in this manner it would appear that lucerne requires more water than any of our farm crops to elaborate a unit quantity of dry matter.

Thus to produce 1 ton of dry lucerne hay approximately 700 tons of water must actually pass through the body of the plant.

The Limiting Factor in Victorian Lucerne Culture.

Now an inch of rain over 1 acre would weigh, approximately, 101 tons; therefore, to produce 1 ton of lucerne, about seven inches of water must actually pass through the growing crop. We see here very clearly a most important limiting factor in the production of heavy lucerne crops in Victoria. Under a rainfall of, say, 21 inches, we may calculate the maximum possible production of lucerne. If the whole of this rainfall could be made to pass through the crop, and none dissipated from the soil by evaporation, then 3 tons of lucerne hay per annum could be raised on a 21-inch rainfall. These conditions, however, could obviously never be realized in practice, for, under the most efficient system of cultivation, considerable losses of water from the soil, by evaporation, are inevitable.

This, indeed, would be specially true after cutting the crop, for then a large proportion of the soil would be exposed to the direct rays of the sun, until the new crop had grown sufficiently to cover the ground.

In ordinary practice, at least, 25 to 33 per cent. of the rainfall would, on an average, be dissipated by direct evaporation, and with poor lucerne stands, and badly cultivated soils, the losses would be still higher.

In the experiments at Werribee 16 per cent. of the water added was lost, in spite of the fact that the surface was protected by a well-stirred gravel mulch.

Assuming, however, that 33 per cent. of the rainfall is a fair estimate of the direct loss from the soil by evaporation, then 2 tons per acre would represent the maximum production possible for a rainfall of 21 inches, provided always, of course, that the lucerne cannot draw on

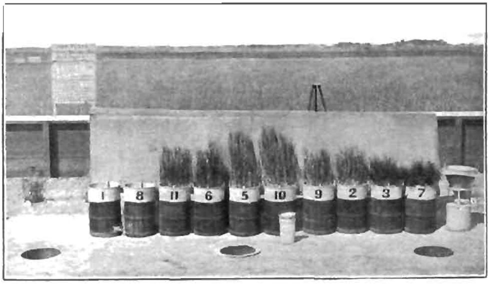


Fig 2.—Pot experiments to determine the water requirements of farm crops. Each pot holds 280 lbs. of soil. Pots 1 and 8, Bare Fallow; 6 and 11, Algerian oats; 2 and 9, Federation wheat; 5 and 10, Cape barley; 3 and 7, Lucerne. On the right is the water collector, and in the foreground a rain gauge. The pots are placed in the soil in order to keep the temperature of the pot the same as that of the surrounding soil.

subterranean sources of permanent water. Such supplementary sources of water supply are met with in many parts of the State, especially on the banks, and in the neighbourhood of creeks and rivers. One of the most productive lucerne belts in New South Wales, *e.g.*, Tamworth, owes its value of the presence of subterranean supplies of fresh water within reasonable depth of the lucerne roots.

In the Nemingha Valley (New South Wales) the Peel and the Cockburn rivers junction on a fertile plain lying between two high ranges of hills. The eroding action of the stream has, in places, undermined lucerne fields planted two generations ago. Occasionally a portion of the field thus undermined collapses, and the lucerne tap-roots, hanging perpendicularly, like giant whip-cords 25 to 30 feet long, can be seen running straight from soil to underground stream, whence is drawn the greater part of the vitalizing fluid for the support of the

luxuriant crop above. But, in these cases, the amount of rainfall is obviously not the limiting factor in crop production, for the crops are naturally sub-irrigated with permanent and unlimited supplies of water. We may, however, disregard these specially-favoured localities in our discussion.

In the northern irrigated belt of Victoria, where lucerne will be largely grown, as the irrigated area expands, adventitious sources of water, such as described above, will not be available; hence, such lucerne as is sown, must rely on the rainfall, supplemented with supplies of irrigation water.

How much irrigation water must be applied to give satisfactory crops? According to the results obtained at Werribee, 7 acre-inches of water must be transpired by an acre of lucerne to produce a ton of dry matter; this, however, does not include what is lost by evaporation from the soil. Assuming that only one-third of what was applied is so lost, then, at least 10½ acre-inches of water would be required in all for the production of 1 ton of lucerne, and of this 7 inches would be

Fig 3.—A closer view of pot tests showing construction of pots and growth of barley and lucerne in early spring.

required by the crop, and 3½ inches would be lost by evaporation. To produce a crop of 5 tons to the acre, therefore, at least 52½ inches would be needed, and if the rainfall of the district were 21 inches, then 31½ inches, or over 2½ acre-feet, would be needed for the production of 5 tons of lucerne.

Comparison with Field Tests.

The Water Requirements of the 15-acre Bulk Lucerne crop show a close agreement with the results obtained in the Pot Tests. The field was sown in October, 1912, and the quantity of water applied from the time of sowing till the end of the present season (10th May, 1915) was approximately 5.93 acre-feet, or 71.2 acre-inches. During the same period the rainfall amounted to 38.1 inches. The total quantity of rain and irrigation water received by the crop was therefore 109.3 inches in 2⅔ years under review.

On 10th May, 1915, the lucerne, owing to the drought and failure of the irrigation supply, had practically used up all the available soil

moisture, for growth was at a standstill, though the soil was still warm.

In the 2½ years, thirteen cuts of lucerne were obtained, and these cuts accounted for the whole of the rainfall, the irrigation water, and had also drained the surface soil layers of all free water. Unfortunately the weighbridge had not been installed until the beginning of the second season, consequently the exact quantity of hay obtained the summer after sowing is not known. It is estimated, however, that the three cuts gave a total of 1.5 tons over the 15 acres. The second season's yield (six cuts) weighed over the bridge 6.5 tons per acre, whilst the last

Fig. 4.—Determining the water requirements of farm crops. Method of weighing the pots.

season (four cuts) gave 4.3 tons per acre, a total of 12.3 tons of commercial hay or 10.45 tons of dry matter per acre. As this tonnage required 109.3 inches of water, it follows that to produce a ton of dry matter approximately 10.4 inches of water was used up, representing transpiration through the crop and evaporation from the soil. As 6.9 inches of this passed through the crop, it follows that 3.5 inches must have been dissipated from the soil by evaporation.

Factors Affecting the Quantity of Water Required by Crops.

In describing the results of these tests on the water requirements of the lucerne plant, an endeavour has been made to present the results as

simply as possible, without giving too much detail. There are, of course, several factors which govern the quantity of water required to produce a fixed quantity of dry matter of any particular farm crop. For example, there is reason to believe that if certain fertilizing substances, particularly soluble phosphates, are present in the soil in adequate amounts, the plant can, and does, economize in its water consumption. This might possibly have been expected if we regard water as functioning merely as a vehicle for conveying plant food from the soil to the crop.

With a weak soil solution the plant would require to use more water in order to secure the necessary quota of mineral salts to elaborate a fixed amount of dry matter. Consequently, the addition of soluble fertilizers would in such a case enable a lucerne plant to economize water. For the same reason a soil kept at a high moisture content by frequent heavy irrigation will cause a lucerne crop to use water wastefully, *i.e.*, transpire a large quantity of water to produce a fixed quantity of hay.

Fig. 5. Determination of the water requirements of summer forages. First cutting of Japanese Millet, January, 1915.

Finally, certain varieties of the same crop differ very widely in their water requirements. This is, of course, notably the case with wheat. Certain varieties of wheat, as our wheat-farmers now know by experience, are more drought-resistant than others.

Just what the cause of this drought-resistance is, is not exactly known. It may be that the so-called drought-resistant wheats transpire less water to produce a bushel of wheat than the others, and are so able to make best use of the scanty rain. It may well be so with the so-called drought-resisting lucernes.

At a later stage we shall have occasion to further consider these problems, and give the results of tests made to determine the effects of fertilizers, moisture concentration, and humidity, on the water requirements of our various farm crops, native grasses, and weeds, and incidentally to inquire into the problem of drought resistance.

Difficulty in Supplying Lucerne with Sufficient Water.

For the present it is sufficient to realize that to produce heavy crops of lucerne under Victorian conditions requires that considerable quantities of water must pass through the growing crop. It is not sufficient merely to pour this water on the soil at more or less regular intervals. Provision must be made to insure that the water is really used by the

plant, and not merely dissipated by evaporation from the soil surface. Unfortunately, in the majority of our northern irrigation settlements where lucerne is the staple crop, the soil tends to set hard, thus preventing a goodly portion of the water applied from sinking well down into the subsoil. These soils, for the most part, contain a large proportion of fine silty particles, and rest on a stiff clay subsoil. They are very retentive of water, and produce excellent crops of wheat and fruit, but they run together on the application of irrigation water, *and admit large volumes of water with difficulty* Moreover, their fineness of constitution give them considerable capillary power, and with the extreme evaporation characteristic of our hot, dry summers, the losses of water from the soil, compared with the water that actually passes through the crop, is considerable.

It seems probable, therefore, that a considerable proportion of the irrigation water applied to lucerne crops on such soils is actually lost by evaporation, and fails to serve its primary purpose in providing for transpiration of the crop.

Fig. 6.—Application of water to graded land. Observe the evenness of distribution and the function of the numerous cross checks in damming back the water, thus giving each bay a regular and uniform supply. Good grading insures even watering, and allows the water to sink well down to the subsoil. Good grading and uniform watering are essentials to success in irrigated lucerne culture.

The problem in these settlements would, therefore, seem, not so much a question of fertilizers, as of getting the soil into such a physical condition as will enable it to imbibe quantities of water sufficient to provide for the requirements of heavy crops.

Liming, the application of organic matter, and frequent surface cultivation, will assist, but probably deep stirring or subsoiling will be found extremely beneficial.

The favorable returns obtained at the Central Research Farm may be largely attributed to the deep subsoiling (15-18 inches deep) which the whole of the lucerne area received.

It is a matter for regret that portion of the area was not left merely ploughed, and not subsoiled, for purposes of comparison.

At the time the 50 acres were laid down, two and a half years ago, we considered that for profitable lucerne growing on such soil, deep subsoiling was an essential to success, and every acre was accordingly subsoiled.

Thorough grading is another important factor bearing on the question of water supply to the crop.

(2) FERTILIZER AND CULTURAL REQUIREMENTS.

In the February number of the *Journal* a description of the various lucerne experiments was given, and the results of the crop yields for the first three cuts of the season. The manner of preparing the land, the importance of subsoiling and grading operations, methods of seeding and inoculation were discussed in some detail, and further reference to these operations is therefore unnecessary.

(1) *Bulk Lucerne Field.*

Early in the present season the whole of the plots on the field promised to give exceptionally heavy returns, but, owing to the failure of the Pyke's Creek scheme, no irrigation water was supplied from 24th September to 29th December, 1914—a period of over three months. The first cut was very heavy, being considerably over 50 per cent. heavier than the corresponding cut in the previous year, but owing to the failure of the water supply, due to the droughty season, the second and third cuts, which were grown without irrigation, showed, as might have been expected, a considerable falling off.

Water was supplied to the lucerne on 29th December to 7th January, but since that date no irrigation water was available.

The total area of the lucerne plots is 50 acres, comprising—

(1) Bulk plots.
(2) Variety trials.
(3) Fertilizer and manurial trials, and
(4) Inoculation and liming tests.

A variable portion of the best of the bulk plots was used for supplying a daily ration of green lucerne to a herd of 40 Red Poll milking cows. This area is not included in the results of the tests.

The details of the weight of commercial hay (calculated at 85 per cent. of dry matter) are summarized in the tables.

Table IV.—Bulk Plots of Lucerne.

Season 1914-15 (Four Cuts).

No. of Cutting.	Date of Cutting.	—	Acreage Cut.	Total yield of Hay.				Yield of Commercial Hay (containing 85 % dry matter) per Acre.			
				T.	c.	q.	lbs.	T.	c.	q.	lbs.
First ..	Oct. 16, 1914 ..	Old lucerne, sown Oct., 1912	12·26	12	6	2	26	1	0	0	14
		Young lucerne, sown Sept., 1913	26·4	32	5	2	27	1	4	1	7
Second ..	Dec. 9, 1914 ..	Old lucerne, sown Oct., 1912 ..	10·5	8	9	2	23	0	16	0	18
		Young lucerne, sown Sept., 1913	23·5	15	11	0	0	0	13	0	
Third ..	Jan. 5-7, 1915	Old lucerne, sown Oct., 1912 ..	8·19	9	6	0	24	1	2	2	25
		Young lucerne, sown Sept., 1913	24·43	28	16	0	0	1	3	2	9
Fourth ..	Feb. 8-13, 1915	Old lucerne, sown Oct., 1912 ..	10·50	13	19	3	14	1	6	2	19
		Young lucerne, sown Sept., 1913	28·77	29	9	2	20	1	0	2	0

Total yield of hay from 144.55 acres equals—

150 tons 4 cwt. 3 qrs. 22 lbs., or
20¾ cwt. per cutting, or
4 tons 3 cwt. per acre for season 1914-15.

Owing to the failure of the irrigation supply, the growth after the fourth cut was somewhat stunted and irregular. It was decided to utilize the area for grazing purposes for the rest of the season. On the area of 50 acres, comprising experimental and bulk lucerne fields, a herd of 51 milking cows were grazed for six hours daily for 72 days. Seven foals were grazing continuously for 25 days, and 256 sheep continuously for a period of 22 days.

The grazing for the 50 acres, representing the value of the forage after the fourth cut had been taken, worked out in grazing units as follows:—

3,672 cow days.
175 foal days.
5,632 sheep days.

(2) *Experimental Plots.*

Variety Lucerne Trials.—Portion of the area of 15 acres sown in September, 1912, was devoted to variety plots to determine their value for hay production. During the 1913-14 season six cuttings were obtained. The first two cuts were not, however, weighed owing to lack of facilities and pressure of work. The remaining cuts were weighed, and they afford a fairly reliable indication of the value of the different varieties under conditions similar to those obtaining at Werribee.

These results are summarized in table:—

Table V.—*Showing Weight of Lucerne Hay Obtained from Variety Lucerne Plots, Werribee, for Two Years ending June*, 1915

Variety.	1st Cut.	2nd Cut.	3rd Cut.	4th Cut.	5th Cut.	6th Cut.	Average cut for season 1913-14.	1st Cut.	2nd Cut.	3rd Cut.	4th Cut.	Average cut for season 1914-15.	Average cut for 2 years, 1913-15.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Arabian ..	Weight not taken.	Weight not taken.	16¾	29¼	24¼	8¾	19¼	14¾	9	16¾	22	15½	17¾
French Province			16¾	25¾	24¼	9½	19	20	13¾	18¾	33½	19	19
Turkestan ..			11¾	16½	17	1¼	11½	13	5	14¼	18¼	12½	12
Peruvian ..			13¾	23	19¼	8	16	15	9½	16¾	16	14¼	15
Hungarian ..			16¾	22¾	20¾	8	17	16½	11¾	22¼	21¼	18	17½
Spanish ..			12	18	21½	8	14¾	20¾	9½	17¾	19½	17	16
Tamworth ..			25½	26¾	25¼	18	24	20	16	24	26¾	21¾	22¾

Rate of Seeding and Fertilizer Trials.

These formed part of an area of 35 acres sown with Tamworth lucerne in 1913. More time was available for the preparatory work than was the case of the area sown in 1912, and consequently the results, as judged by weight of crop produced, are rather better.

The paddock (35 acres) was seeded on 5th to 8th September, 1913, and during the first season yielded three cuts, which were utilized with other green foliage for silage purposes.

During the past season four cuts were obtained. Early in the season this lucerne field promised to give most prolific returns, but, owing to the failure through drought of the Pyke's Creek scheme, no irrigation water was applied from 24th September to 29th December—a period of over three months. The first cut was exceptionally heavy, being over 50 per cent. heavier than the corresponding cut for last season, but, owing to the failure of the water supply, due to the

droughty season, the second cut was grown without irrigation, and showed, as might have been anticipated, a considerable falling off. The timely irrigation on 29th December, and the favorable rain at Christmas-time, stimulated the third and fourth cuttings, but, as no further water was received after January, the season closed with the fourth cutting on 10th February. For the remainder of the season the whole of the experimental and bulk areas was grazed with milch cows and sheep as indicated above.

Table VI.—*Summarizing the Yield of Hay Obtained from the Rate of Seeding Trials, Fertilizer Trials, Inoculation and Liming Tests, Season*, 1914-15.

Details of Plot.	Oct. 9, 1914. 1st Cut.	Nov. 30, 1914. 2nd Cut.	Jan. 5, 1915. 3rd Cut.	Feb. 10, 1915. 4th Cut.	Total of 4 Cuts, 1914–15.
					Cwt.
(1) Rate of Seeding Trials.					
Plot 1. Tamworth lucerne, 6 lbs. per acre	32·3	18·4	26·3	26·0	**103·0**
Plot 2. ,, ,, 9 ,,	28·3	17·7	21·8	32·9	**100·7**
Plot 3. ,, ,, 12 ,,	34·0	17·5	28·3	27·25	**107·0**
Plot 4. ,, ,, 15 ,,	33·3	17·7	26·4	30·5	**107·9**
Plot 5. ,, ,, 18 ,,	34·5	17·4	25·3	32·3	**109·4**
Plot 6. ,, ,, 21 ,,	33·4	18·9	24·5	33·7	**110·5**
(2) Fertilizer Trials.					Total Hay. Cwt.
Plot 1. Lime 20 cwt., super 2 cwt., blood manure 1 cwt. ..	35·4	19·3	30·5	28·4	**113·6**
Plot 2. Lime 40 cwt., super 2 cwt. ..	28·3	16·0	30·7	29 2	**104 2**
Plot 3. Lime 20 cwt., stable manure 10 tons p.a.	34·6	21·3	27·1	26·0	**109 0**
Plot 4. Lime 20 cwt., super 2 cwt., nitrate soda 1 cwt. ..	37·5	15·4	35·6	30·6	**119 1**
Plot 5. Lime 20 cwt., super 2 cwt., sulphate pot. 1 cwt. ..	32·9	18·1	28·0	23·8	**102·8**
Plot 6. Lime 20 cwt.	35·3	15·3	26·2	27 0	**103 8**
Plot 7. Lime 20 cwt., bonedust 2 cwt.	31·7	18·8	27·2	30·1	**107·8**
Plot 8. Lime 20 cwt., Thos. phosphate 2 cwt.	34·2	15·2	27·5	27 3	**104·2**
Plot 9. Lime 20 cwt., super 2 cwt. ..	33·0	17·3	27·0	31·0	**108·3**
Plot 10. Ground limestone 36 cwt. ..	32·1	12·2	26·3	26·2	**98·8**
Plot 11. Nil	27·4	15·1	25·9	24·3	**92·7**
Plot 12. Super 2 cwt. .. .	33·0	17·3	29·5	31·2	**111 0**
(3) Inoculation and Liming Tests.					Total for 4 Cuts. Cwt.
Plot 1. Not limed, not inoculated ..	33·1	10·9	26·9	28·6	**99·5**
Plot 2. Not limed, inoculated 1 ton lucerne soil	30·3	13·5	26·1	95·1	**95·0**
Plot 3. Not limed, inoculated 2 cwt. lucerne soil	28·5	15·1	26·2	29·2	**99·0**
Plot 4. Limed, not inoculated ..	20·1	10·5	26·4	28·8	**94·8**
Plot 5. Limed, inoculated 1 ton lucerne soil	30·0	13·7	26·0	28·9	**98·6**
Plot 6. Limed, inoculated 2 ton lucerne soil	31·7	13·7	26·1	26·4	**97·9**

Comment on Tests.

In carrying out the weighing and sampling of hay from these plots, the greatest care has been taken to obtain data for a uniform basis of comparison.

Every load of hay brought to the weighbridge was carefully sampled, and the samples immediately forwarded in hermetically sealed receptacles to the Agricultural Laboratory for the determination of the dry matter. The figures given in the tables represent the weight of hay reduced to the basis of commercial lucerne hay containing 85 per cent. of dry matter.

It is far too early to draw deductions from the results of the various plots, and the possible bearing of the results on practice. It will be time enough to draw such generalisations when more data has been accumulated. Meanwhile, there are features of interest in these tests that are worth pointing out, if only to see whether later experience will confirm or modify what now seems reasonably true.

Fig. 7.—Cutting lucerne with single horse mower to provide daily ration for Red Polled Dairy Herd, Werribee.

1. *Regarding the Prolificacy of Irrigated Lucerne at Werribee.*—No one would claim that the land on which this lucerne was grown was by any means ideal lucerne soil. Nor could it be said that the land is much better than the average irrigation land on the Werribee Estate. Yet the return from a 15-acre block averaged 6½ tons of commercial hay in the second year of growth, besides providing considerable winter grazing for sheep. The yield for the third season exceeded 4 tons per acre, in spite of the fact that no water was received for irrigation purposes from 24th September to 28th December, 1914—a period of over three months. Moreover, after the irrigation extending from 28th December to 7th January the water supply was cut off, and no further water was available for the season. Had the water been available during this period, it is reasonable to expect that the yield for the third season would have considerably exceeded that of the second. Again, the average yields from the experimental plots (sown September, 1913) for the present season exceeded 5 tons per acre, though these plots only received three irrigations for the year.

From this it is apparent that irrigated lucerne sown under conditions similar to those at Werribee promises to be a most prolific and profitable crop, and the completion of the Exford weir should enable the Werribee Irrigation Estate to become a highly prosperous settlement.

2. *Effect of Soil Inoculation.*—With regard to the inoculation tests, a comparison of the six plots will reveal that during the second season of growth there is very little difference between the inoculated and the corresponding non-inoculated plots. The first year, however, the differences were very marked. One of the most striking ocular demonstrations at Werribee during the summer of 1912 was the difference in the appearance of four 2½-acre blocks of lucerne, two of which were inoculated with lucerne soil from Bacchus Marsh, and two of which were not inoculated. As autumn and winter approached, the differences became less marked, and in the second season they had disappeared altogether. So with these smaller plots; at first the inoculated plots were a rich healthy green, and examination of the young roots

Fig. 8.—Thirty-five acre block of two year old lucerne, Central Research Farm, Werribee, season 1914-15.

showed that nodules were forming freely. The non-inoculated plots showed in the early stages a pale, yellowish, unthrifty appearance, but as the season wore on the difference between the plots gradually disappeared. It can only be surmised that the non-inoculated plots became slowly inoculated through the medium of the irrigation water as it flowed from plot to plot and from field to field, and this is borne out by the appearance of nodules on the non-inoculated plots in late autumn following the seeding.

The point to note, therefore, is that inoculation should not be necessary in a district where successful lucerne growing under irrigation has been carried on for a time, and that, in cases where lucerne has never been sown on a farm or in a district before, an effective inoculation of a relatively small area should soon lead to the inoculation of the whole area, by the carrying of the bacteria by air, dust, irrigation water, stock, and farm implements.

3. *The Effect of Various Fertilisers.*—The results of the fertiliser tests are of interest. It will be noted that by far the highest crops were obtained by using nitrogenous manures. In view of what has been said already regarding the ability of lucerne to obtain its nitrogen from the air, this may perhaps seem strange. But the explanation is simple enough. To secure the necessary nitrogen from the air, energy must be expended by the bacteria living on the lucerne roots, and by the lucerne in providing food for the bacteria. If you supply the nitrogen in the form of manure, or provide an excess of it in the soil, then the lucerne will prefer to use what is so supplied, instead of extracting it with the expenditure of more or less energy from the air.

Generally, it is not considered good farming practice to apply nitrogenous manures to a leguminous crop like lucerne. It is considered proper that the lucerne should be forced to obtain its nitrogen from the inexhaustible supplies in the air. But, if the farmer can secure a handsome profit by applying a nitrogenous manure to a legume is not he

Fig. 9.—Harvesting lucerne, Central Research Farm, Werribee.

justified in doing so? Examination of the results of the fertiliser trials will show that the plots dressed with nitrate of soda, blood manure and farmyard manure have yielded considerably in advance of the remaining manures.

If these plots continue to stand out prominently, the question of applying nitrogenous manures may become of immediate practical importance.

Effect of Phosphatic Manures.—It appears from the results of these preliminary tests that superphosphate is the most effective of the phosphatic manures in the early stages of the lucerne. It has given the best results where it has been applied by itself. When applied with lime the crop yields appear to be depressed, especially with heavier dressings.

Plot 11.—No manure, yield 92.7 cwt.
Plot 12.—Super., 2 cwt.; yield 111.0 cwt.
Plot 9.—Super., 2 cwt.; lime, 20 cwt.; yield, 108.3 cwt.
Plot 2.—Super., 2 cwt.; lime, 40 cwt.; yield, 104.2 cwt.

Probably the addition of lime has led to the reversion of the water soluble phosphate in the superphosphate to insoluble forms, and thus rendered the phosphates temporarily ineffective.

Lime.—So far as the action of lime is concerned, it appears that it has most immediate effect when applied as slaked lime. Thus, 20 cwt. of lime applied in the form of slaked lime has given a far better crop than 36 cwt. of ground limestone containing the same quantity of lime. Thus:—

Plot 11.—No manure, 92.7 cwt.
Plot 10.—Ground limestone, 36 cwt.: 96.8 cwt.
Plot 6.—Lime 20 cwt.; 103.8 cwt.

This, of course, might possibly have been expected. Ground limestone acts very slowly on the soil, but its effect is nevertheless very lasting, and some time must elapse before its full effect becomes noticeable on the crop.

Rate of Seeding Trials.—The results of the rate of seeding trials emphasize how small a seeding may give a good stand, if the soil and weather conditions are favorable at the time of sowing. The six plots,

Fig. 10.—Carting baled lucerne hay to market.

varying in seeding allowances from 6-21 lbs., were sown on a very fine seed bed on 5th September, 1913. Several timely ½-inch showers, at intervals of a week, followed by good soaking rain, kept the surface moist, and gave a good germination. The plots sown with 6 and 9 lbs. per acre, while thoroughly satisfactory, have given slightly lower returns per acre, for the season, than the heavier seedings.

Sixteen pounds per acre is the allowance we have adopted in practice, and all areas seeded with this quantity have given excellent stands.

Weather and soil conditions, at the time of seeding, determine whether more or less than this average quantity should be sown.

SUMMARY.

1. Lucerne is one of the most valuable forages that can be grown on an irrigation farm.

2. The factors making for maximum yields of lucerne under irrigation conditions have been the subject of experimental investigation at Werribee.

3. These experiments comprise tests of (1) water requirements, (2) cultural requirements, (3) fertilizer requirements of lucerne.

4. A lucerne crop transpired approximately 681 tons of water to produce 1 ton of dry matter at Werribee for the season 1914-15.

5. By giving a lucerne crop as much water as it could use up during the season 1914-15, an equivalent of 8 tons 16½ cwt. of dry lucerne was produced per acre.

6. To produce this quantity, however, no less than 72 acre-inches of water were required, of which 61 acre-inches had to pass through the crop, and 11 acre-inches was dissipated from the soil by evaporation.

7. In field tests the water requirements of lucerne were even greater, on account of the impossibility of obtaining a perfect mulch, and thus keeping down the loss by evaporation from the soil.

8. On a block of 15 acres, sown in October, 1912, 12.3 tons of commercial hay, containing 10.45 tons of dry matter, were produced in 2½ years. During this period 9.1 acre-feet of water was supplied as rain and irrigation water.

9. Consequently, under field conditions, for every ton of dry hay produced at Werribee, 10½ inches of water were required, 5½ inches of which was lost from the soil by evaporation and 7 inches by transpiration.

10. An acre of lucerne in full growth will use up considerably more water than would be lost by evaporation from a free water surface of equal area.

11. The presence of a sufficiency of soluble phosphates helps to reduce the Transpiration Ratio, and this makes the crop more economical of water.

12. A 15-acre block of lucerne at Werribee yielded 6½ tons of commercial hay during the second season of growth; and 4.3 tons during the third season, though receiving only three irrigations during the past season.

13. Tamworth lucerne has given the best average yield during the past two years, averaging 22¾ cwt. per acre for ten cuts.

14. The heaviest seedings of lucerne gave the best returns, but there appears to be no material benefit in sowing more than 18 lbs. of seed per acre. 16 lbs. is the seeding adopted at Werribee.

15. The application of artificial fertilizers gave decided and profitable increases over the unmanured plots.

16. Nitrogenous manures, though not generally used to fertilize leguminous crops, gave the most marked crop increases.

17. Superphosphate proved to be the most efficient of the artificial phosphates. An application of 2 cwt. at seeding, costing 9s., gave an increase of a ton of lucerne hay to the acre in the second season of growth, and this in spite of the dryness of the season.

18. Lime has given an increase in crop yields, but the increase was barely sufficient to cover the cost of the application. Heavier dressings than 20 cwt. appear to depress the yield. The effect of these manures will probably be felt next season.

19. Lime has given greater crop increases than an equivalent value of ground limestone, though the effect of the latter manure may be expected to persist longer.

20. In view of the heavy demands made on the mineral constituents of the soil by good lucerne crops, top dressings, applied every winter, of phosphates at the rate of 1½ to 2 cwt. per acre are recommended.

21. On soils similar to Werribee, dressings of lime or ground limestone, applied every two years, at the rate of 10-12 cwt. lime and 20-25 cwt. ground limestone are likely to prove profitable.

22. *Inoculation of the soil with soil from an old lucerne field* is recommended for localities where lucerne has never hitherto been grown. Once a small portion of the farm is so treated the remainder soon becomes inoculated through the moving of stock and implements, and through the agency of irrigation water.

WOOL CLIP AND ESTIMATED TOTAL PRODUCTION—SEASON 1914-15 AND THE FOUR PREVIOUS SEASONS.

Districts.	Wool Clip.		
	Sheep.	Lambs.	Total.
	lbs.	lbs.	lbs.
Central	5,140,421	366,296	5,506,717
North-Central	5,298,171	434,933	5,733,104
Western	23,322,568	1,728,321	25,050,889
Wimmera	10,597,726	756,520	11,354,246
Mallee	2,955,348	180,328	3,135,676
Northern	8,523,435	654,078	9,177,513
North-Eastern	4,415,567	444,701	4,860,268
Gippsland	4,752,069	520,420	5,272,489
Total Clip 1914-15	65,005,305	5,085,597	70,090,902
.. 1913-14 ..	74,157,932	5,868,688	80,026,620
.. 1912-13 . ..	65,666,190	4,170,780	69,836,970
.. 1911-12 . ..	81,902,229	6,504,990	88,407,219
.. 1910-11	73,959,226	6,115,044	80,074,270
Average Weight of Fleece, *1914-15* ..	6·37	2·16	5·58
.. .. .. 1913-14 ..	7·50	2·35	6·46
.. .. .. 1912-13 ..	6·31	2·20	5·68
.. .. .. 1911-12 ..	7·28	2·33	6·29
.. .. .. 1910-11 ..	6·99	2·50	6·15
Difference between 1914-15 and 1913-14—Decrease	1·13	0·19	0·88

	lbs.
Wool clip	*70,090,902*
Estimated quantity of wool stripped from Victorian skins and on Victorian skins exported	25,315,965
Total 1914-15	95,406,867

Note.—The total for 1913-14 was 106,833,690 lbs.; 1912-13, 88,762,612 lbs. *1911-12, 110,463,041 lbs.; and 1910-11, 101,803, 644 lbs.*

The quantity of wool produced last season was worth approximately £3,410,913.

Office of the Government Statist,
Melbourne, 21st May, 1915.

A. M. LAUGHTON,
Government Statist.

THE WALNUT.

(Continued from page 309.)

C. F. Cole, Orchard Supervisor.

PROPAGATION.

Soil.

The most desirable soil for propagating the walnut in the nursery row is a medium heavy, easily-worked one, containing humus, and of a deep friable nature, well drained, having moisture-retaining properties. Specially prepared and treated soils belonging to this class will produce trees of greater growth and vigour more quickly than soils of a light or sandy nature.

Soil Preparation.

In the autumn, break up the land as deep as possible, the deeper the better, and reduce to a fine tilth. Plough in any farmyard or stable manure procurable. Work the land deep with a tooth cultivator before planting in early spring. When the soil is free from lumps, mark out the rows 4 feet apart; this will allow a small horse cultivator to be used in keeping the soil well stirred between the rows, as constant stirring of the soil should be practised around and about the young walnuts during their vegetative period. The seedlings also should not suffer from the want of soil moisture during the drier months, *i.e.*, if seedlings are to be raised the first twelve months sufficiently large for grafting purposes.

ROOTSTOCKS.

To allow the perpetuation of a choice or selected variety of walnut it is necessary to resort to grafting or budding to keep the type true. This is also the case if a large number of individual trees true to the parent type are required for planting a grove upon commercial lines.

To do this, use seedling rootstocks allied and with affinity to the scion or bud of the walnut required. The question of selecting suitable rootstocks is of great importance, and is to the future tree what a good foundation is to a house. Rootstocks should produce thrifty, vigorous, and productive trees, enabling them to be grown under many different conditions as regards soil and localities. A rootstock that may be suited for a certain class of soil under irrigation, or subject to wet conditions, may be unsuitable for drier soil conditions, and *vice versâ*. What is desired is a good all-round rootstock, upon which the English walnut, when worked, will flourish, and one that is not easily affected by the unfavorable conditions which prevail at times in this State. The English seedling as a rootstock has been practically discarded in California; the nurserymen now use the indigenous black varieties of walnuts, and also hybrid seedlings raised from nuts. These hybrid nuts are secured from trees influenced by the exchange of pollen (fertilizing dust) between two species of walnuts growing in close proximity

to one another. The cross between the American wild black species is named royal hybrids, and that between the black and English varieties is called paradox hybrids. The Californians find that the black and hybrid rootstocks will stand unfavorable conditions better than the English seedling. Selected English varieties, on the other hand, are more prolific, and generally come into bearing earlier than when worked upon their own seedlings. Some of these trees, five years planted in the grove, produced from 12 to 20 lbs. of nuts. Experiments were carried out in California by grafting the selected variety (Placentia perfection) upon different rootstocks such as the North Californian black, English, and Paradox. The result was in favour of the Paradox root, the tree at four years of age being twice as large as that upon the English root, and much larger than the tree upon the North Californian black root. All these trees were grafted and planted out at the same time, and were of uniform size, growing adjacent to one another, and under uniform conditions. That the production of nuts is proportionate to the size of the trees is shown by the crop of 1911; the tree upon the Paradox root produced 18½ lbs., that upon the Northern Californian black root 12½ lbs., and that upon the English root 9 lbs. (Bulletin No. 231). The writer has no doubt that the Californian black varieties will prove valuable for rootstock purposes in Victoria, because I have seen at Mr. J. M. Rutland's orchard, Kiewa, Victoria, numerous young trees, about six years of age, growing exceedingly well. Such trees have been planted with the object of utilizing them for timber. Although the hybrid rootstocks are highly spoken of in California, the royal hybrid being particularly adapted for wet and heavy soils, and even doing well upon drier soils, or without irrigation, there is very little likelihood of these hybrid rootstocks being largely used by the nurserymen there, owing to a very uncertain percentage of hybrid trees developing in the nursery from nuts gathered from trees subject to the influence of inter-pollinations, and, in addition, it requires a special knowledge to separate these hybrid roots from those of the straight black species.

Californian experiments seem to prove that only the first generation seedlings, that come directly from black walnuts which have been cross-fertilized with pollen of the English walnut in the Paradox, and royal hybrids, are suitable for rootstock purposes. The first generation of nuts some seasons produce from 40 to 50 per cent. of hybrids.

The second generation Paradox seedlings, that is, seedlings grown from nuts gathered from hybrid trees are unsuitable for the English varieties, such rootstocks producing trees lacking in any unusual vigour.

The whole question of the value of hybrid roots is, indeed, one concerning the progeny of individual special trees, rather than a matter of any general rules applying to all crosses between certain species. (Bulletin No. 231.)

The two black varieties of walnuts recommended in California as suitable for working the English varieties upon are as follows:—For wet soils or moist conditions, the Northern Californian (Juglans Hindsii), and for dry conditions and soils of a sandy nature the Southern Californian (Juglans Californica). There should be no trouble in securing and importing nuts from California of these two black species

When procuring nuts of any species for growing rootstocks, they should be secured from well-matured trees of a thrifty and vigorous habit. Culls should not be planted. Any seedlings that are not thrifty, or show a weakness in growth, should not be used for rootstock purposes. This is most important, as only scions or buds successfully worked upon the fittest rootstock can be expected to develop into vigorous and thrifty trees. In localities where the English walnut thrives upon its own roots, selected English seedlings as rootstocks may be used until such times as the black rootstocks have been proved. In soils or localities subject to adverse conditions, however, the writer does not recommend planting the walnut upon commercial lines if the trees are upon their own roots or worked upon English seedlings rootstocks. Guided by American experiences, the risk of failure should be greatly minimized if selected types of English walnuts worked upon either of the two species of indigenous American black varieties recommended as suitable for rootstock purposes are planted. The grower may rest assured that wherever the black species will thrive and make vigorous trees the English varieties will do well if worked upon them.

TREATMENT OF NUTS.

As soon as the selected nuts for planting have been harvested and dried (washing not being necessary) they should be put into old sacks and stored in a cool place, a damp atmosphere being preferred to a dry one. About July they should be placed in alternating layers of moist sand or some suitable compost made from decomposed straw, grass, or fallen leaves, mixed with decayed stable manure, or cow droppings, if available. The method adopted in California is to place the nuts in early winter in shallow wooden boxes containing two layers of nuts, and imbedding in sand or a suitable compost, finally covering the nuts with 3 to 4 inches of sand or compost, the bed being so constructed that water will easily drain away. If allowed to remain too wet, the nuts will rot. If too dry the nuts will not germinate. After placing the boxes in position, and covering them, water well, continuing to do so, if necessary, thus keeping the nuts well moistened, in order to start germination. The germinating bed should be so situated that it will receive the heat of the sun, and not be too cold for germination. The trays may be placed upon beds made from stable manure, covering them with sand afterwards. Nuts vary according to their species as regards their freedom of germination. The Southern Californian black sprouting earlier than other black walnuts, do not require to be kept so moist or placed in the germinating bed so early as the Northern Californian black or royal hybrid nuts. The latter require plenty of moisture and warmth to make them sprout, and if planted out into the ground before starting to germinate, may not sprout until the second or third year from planting. The Californian authorities recommend that in varieties which are hard to germinate the nuts should be placed in single layers in the box and kept well moistened, and as warm as possible, otherwise many of the nuts will not sprout the same year as planting. There is no difficulty in getting the English varieties to sprout if the nuts are sound.

RABBIT DESTRUCTION.

FRUIT AND CARROT POISONING.

By E. E. Allan, Chief Inspector, Vermin Destruction Act.

The Art of Free-feeding.

All animals or birds that collect in any number have amongst them a proportion that rule or "boss" the others. This is specially so as regards the rabbit. When the "free-feed" is found, the stronger ones will take possession, and hunt or keep the others away till they have eaten their fill, and none may then be left to educate the balance. Any one who will take the trouble to lie in hiding and watch the freshly-laid furrows will see the stronger take possession, and hunt the weaker away. The next day, when it is found that all the feed is gone, most people merely relay the same quantity. This is again eaten by the same ones that had it before, and so on, till the poison baits are laid, when, of course, only those that have been "educated" are killed. The others have not had a chance to acquire the taste, and, as is most likely the case, if there are poisoned baits left in the furrows, it is just the same to them as if there had been no free-feeding at all. The rabbits only get to the baits because the stronger rabbits are killed, and certainly will not take the poisoned baits under such circumstances. If this were not so, what would be the object of free-feeding at all? It is, of course, plain that free-feeding means the partaking by the rabbits of a lot of baits, while only a very few are taken when poisoned. Now, the essence of the work is this:—When the free-fed baits are all taken (eaten) the first night, a far larger quantity must be laid the second time. If this is all eaten, then still more the third time. If still all is eaten, enough must be used to have some left in the morning, and then, if there is a good deal left, stand off for a night and let the rabbits clean it up before any poison is laid. The essential thing is to make sure that all the rabbits get the free-feed, and this can only be done by finding that some is left over. Practically a clean sweep can be done by this liberality. A man may get seven or eight hundred out of a thousand with insufficient free-feeding; but the man I want is he who can get the other two or three hundred, and this he can do by following out these instructions. Most land-holders stint both the free and poisoned baits—the most false economy possible. As a matter of fact, there is no need in free-feeding to study the distance between the baits where rabbits are plentiful. Simply scatter them along the furrow liberally. I have known places where rabbits are so thick that the same could be done with the poisoned baits, *i.e.*, a rich flat, or such like, where they congregate for feed. It is hardly possible to err on the bountiful side; but very easy to be the other. Inspectors are instructed to study out and thoroughly follow the way I have laid down, and to impress the same strongly on all land-holders interested.

The wonderful results of the present methods are becoming more patent every day; and if failure follows the work, it can only be put down to one of two things—incapacity or indifference, with, of course,

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commencing 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breed.	Owner.	Totals.			Position in Competition.
			15.4.15 to 14.5.15	15.5.15 to 14.6.15	Two months.	
		LIGHT BREEDS.				
		WET MASH.				
19	White Leghorns	L. G. Broadbent	135	136	271	1
2	..	E. A. Lawson	124	120	244	2
53	..	W. G. Swift	104	140	244	
34	..	H. McKenzie and Sons	105	138	243	4
6	..	F. Doldissen	125	115	240	5
9	..	J. Schwabb	112	126	238	6
8	..	C. J. Jackson	113	124	237	7
21	..	E. B. Harris	116	120	236	8
7	..	Marville Poultry Farm	123	109	232	9
30	..	A. E. Silbereisen	101	130	231	10
38	..	G. McDonnell	92	135	227	11
42	..	W. M. Bayles	101	122	223	12
60	..	*R. C. Brock*	129	93	222	13
5	..	J. J. West	103	117	220	14
16	..	N. Burston	115	103	218	15
52	..	A. A. Sandland	114	102	216	16
33	..	*A. W. Hall (5 birds)*	126	85	211	17
18	..	D. Adams	96	114	210	18
32	..	*F. Hodges*	103	107	210	
4	..	R. Hay	97	112	209	20
25	..	Giddy and Son	118	89	207	21
39	..	W. M. Sewell	109	97	206	22
51	..	A. H. Mould	109	97	206	
26	..	A. Mowatt	98	107	205	24
44	..	Mrs. F. M. Oliver	94	110	204	25
10	..	A. E. Tuttleby	84	117	201	26
3	..	J. H. Gill	96	98	194	27
1	..	Mrs. H. Stevenson	101	92	193	28
36	..	Weldon Poultry Yards	94	89	183	29
57	..	B. Mitchell	88	91	179	30
28	..	R. Lethbridge	63	113	176	31
15	..	H. N. H. Mirams	70	106	176	
50	..	John Hood	79	90	169	33
48	..	C. J. Beatty	88	79	167	34
23	..	Fulham Park	57	110	167	
40	..	C. C. Dunn	85	80	165	36
11	..	J. B. Brigden	71	92	163	37
43	..	H. I. Merrick	56	105	161	38
47	..	*J. C. Armstrong*	92	68	160	39
46	..	R. Berry	99	60	159	40
49	..	Bennett and Chapman	49	110	159	
24	..	Lysbeth Poultry Farm	70	86	156	42
20	..	R. W. Pope	66	89	155	43
59	..	W. G. Osburne	89	65	154	44
55	..	W. N. O'Mullane	57	97	154	
13	..	J. Hustler	65	88	153	46
22	..	S. Buscombe	93	58	151	47
17	..	Mrs. E. Zimmerman	83	68	151	
54	..	W. G. Clingin	64	87	151	
14	..	W. Flood	56	88	144	50
12	..	G. Hayman	59	82	141	51
45	..	South Yan Yean Poultry Farm	49	81	130	52
58	..	Thirkell and Smith	87	30	117	53
41	..	J. A. Donaldson	38	74	112	54
37	..	A. Ross	53	44	97	55
31	..	L. McLean	60	36	96	56
56	..	C. Hurst	47	48	95	57
27	..	J. A. Stahl	5	85	90	58
		Total	5,075	5,554	10,629	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breed.	Owner.	Totals. 15.4.15 to 14.5.15.	15.5.15 to 14.6.15.	Two months.	Position in Competition.
		LIGHT BREEDS. DRY MASH.				
80	White Leghorns ..	W. H. Robbins	126	154	280	1
66	.. ..	E. A. Lawson	134	106	240	2
79	.. ..	Lysbeth Poultry Farm ..	113	120	233	3
64	.. ..	W. M. Bayles	122	107	229	4
72	.. ..	Mrs. E. Zimmerman ..	131	93	224	5
68	.. ..	H. McKenzie and Son ..	83	130	213	6
69	.. ..	E. MacBrown	92	145	207	7
78	.. ..	H. Hanbury	90	103	193	8
62	.. ..	Benwerren Egg Farm ..	123	60	183	9
65	.. ..	Thirkell and Smith ..	123	48	171	10
67	.. ..	C. C. Dunn	89	81	170	11
76	.. ..	A. A. Sandland	95	68	163	12
71	.. ..	*Moritz Bros.*	49	106	155	13
63	.. ..	A. A. Padman	86	37	123	14
77	.. ..	South Yan Yean Poultry Farm	18	57	75	15
61	.. ..	Mrs. H. Stevenson ..	28	43	71	16
75	.. ..	Fulham Park	9	60	69	17
74	.. ..	J. H. Gill	18	43	61	18
73	.. ..	C. L. Lindrea	29	5	34	19
		Total	1,558	1,536	3,094	
		HEAVY BREEDS. WET MASH.				
81	Black Orpingtons ..	Mrs. T. W. Pearce ..	143	132	275	1
100	.. ..	J. H. Wright	111	159	270	2
97	.. ..	Marville Poultry Farm ..	135	106	241	3
94	.. ..	D. Fisher	113	114	227	} 4
90	.. ..	Oaklands Poultry Farm ..	88	139	227	} 4
96	White Orpingtons ..	Stranks Bros.	93	111	204	6
88	Black Orpingtons ..	J. McAllan	94	105	199	7
85	.. ..	H. H. Pump	78	114	192	8
99	.. ..	*L. McLean*	70	118	188	9
91	.. ..	A. Greenhalgh	83	99	182	10
86	.. ..	C. E. Graham	48	133	181	} 11
89	Rhode Island Reds	E. W. Hippe	63	118	181	} 11
87	Black Orpingtons ..	W. C. Spencer	72	100	172	13
95	Silver Wyandottes ..	W. H. Forsyth	74	89	163	14
84	Black Orpingtons ..	Cowan Bros.	28	109	137	15
83	.. ..	G. Mayberry	57	69	126	16
93	.. ..	L. W. Parker	14	94	108	17
92	.. ..	J. Ogden	21	45	66	18
98	Faverolles ..	K. E. Courtnenay ..	—	38	38	19
82	White Wyandottes	J. B. Brigden	—	—	—	20
		Total	1,385	1,992	3,377	

MONTHLY REPORT.

Weather conditions for the past month were, on the whole, seasonable. Cloudy weather, with much rain chiefly obtained, with intervals of bright sunshine and occasionally high winds. Temperatures were generally low. The egg yield for time of year has been good, some especially good scores being put up by the heavy breeds. Broodies numbered twenty-five for the month, including four Leghorns. Rainfall, 442 points.

Department of Agricult
Melbourne, Victoria

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Pruning.

In pruning the young trees, heavy pruning will be required in order to produce strong growth and a good frame, but as the tree advances in age, the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree is in a healthy condition; so, when the trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be so pruned that they will not produce too heavy a crop in the fruiting year; and at the same time produce wood in their fruiting year to give a crop the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portion of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

Spraying.

Spraying should be carried out on the lines indicated in last month's notes, and it should be completed by the end of the month.

Planting.

The planting of deciduous fruit trees will still be continued on the lines laid down in last month's notes. Care should be taken to have the soil thoroughly sweetened and aerated, the roots should be well trimmed, and the young tree firmly planted. Owing to the time that elapses between the removal of the tree from the nursery row and the planting of the tree in its permanent situation, practically the whole of the fibrous and feeding root system has been destroyed. It will be well to remove all of the finer roots, and to thoroughly trim back the stronger ones. This will allow the tree to make a new root system for itself.

In planting a commercial orchard, it has been previously advised that the number of varieties should be limited, and that, as far as possible these varieties should have a corresponding bloom period. The necessity for cross-fertilization is becoming more apparent every year, and it is now definitely known that cross-fertilization results in greatly increased crops, and also in fruit of an increased size. In the experiments of Waite, on the "Pollination of Pear Flowers," and of Lewis and Vincent, on "The Pollination of the Apple," their results were invariably that the largest fruits were crosses. Fruit-growers in this State have observed that where blocks of different varieties of the same

kind of fruit have been planted alongside of each other, the adjoining rows of the two varieties have always carried the heaviest crops. Experience is thus against the planting of large blocks of any one variety: at the same time the varieties must not be multiplied indefinitely. The Jonathan apple is generally considered to be a consistent bearer and self-fertile; but even this prolific variety may be made to largely increase its yield by intermingling with another variety having a similar bloom period; and it has been found that the Sturmer Pippin is one of the best for the purpose. Dumelow's Seedling, Reinette du Canada, and Stone Pippin also flower at the same time. For fuller information on this subject, reference may be made to the articles in the *Journal* for January, 1911.

The Vegetable Garden.

The addition of gypsum to the vegetable plots prior to digging will rid the soil of a large number of insects that infest the vegetables in spring, and thus numbers of vegetable pests, such as caterpillars, aphis, &c., will be killed. The gypsum may be dug into the soil at the rate of about 2 ozs. to the square yard. Another trouble in the vegetable garden at this season of the year is the snail and slug pest. The article on slugs and snails in the December, 1910, *Journal* may be consulted, but one means of reducing this pest is to keep the plot free from weeds. As hoeing is generally out of the question in winter, the weeds should be hand-pulled. Where any foliage is in direct contact with the ground, it should be lifted occasionally, and a light dusting of lime sprinkled underneath. All seedlings of sufficient size should now be planted out; this includes onions, asparagus, lettuce, cabbage, cauliflower, &c. A planting of broad beans may be made, and also all varieties of peas. Seeds of summer cabbage, lettuce, leeks, onions, radish, parsnip, may now be sown. Tubers of Jerusalem artichokes should be planted out, and also a few early potatoes. Seeds of tomatoes may be planted in the frames, and also, towards the end of the month, seeds of melons, cucumbers, marrows, pumpkins, may be sown under glass in the hot bed.

The Flower Garden.

The Iris.

A section of garden plants that is increasing in popularity is the iris family. It is usually accepted that irises produce their flowers in spring and early summer. There is a certain amount of truth in this, because the bulk of the iris varieties bloom at those times. This is notably so in regard to the German section and its allies, to the Japanese, and also to the bulbous irises of the Spanish and English sections. The new Dutch irises, too, flower in spring and summer. The first iris to bloom is a most charming one, of rich, metallic blue colour, each of the falls having a central stripe of gold. This is *Iris alata*, and is known as the Scorpion iris. It has thick fleshy roots, and should be allowed to remain in the same place permanently. The Scorpion iris flowers in April, May and June. Following this comes that beautiful heliotrope iris which flowers from May to September, *Iris stylosa*. This is one of the most useful plants for winter flowers, as the established clumps produce great abundance of blooms. The flower buds should be

gathered every day, and placed in water in the house, when they will open freely. There are several varieties of this iris, ranging from white and heliotrope almost to purple. The next section to flower is *Iris germanica*, of which with its relations many hundreds of beautiful varieties are now grown. This is the section known as Flag irises. Such varieties as Madame Chereau, Innocenza, Kharout, Mrs. H. Darwin, Victorine, and Miss Maggie are all very beautiful, while Jacquiniana and Iris King are two of the most beautiful forms, almost red, that have been grown.

A variety flowering in early spring, and belonging to the bulbous section is *Iris tingitana*. This has beautiful blue flowers, carried on long stems, and is very distinct in appearance. The flowers are somewhat like the Spanish section, but they are much larger. The whole of the irises previously mentioned are fond of lime.

The Japanese iris, or *Iris Kæmpferi*, is one of the most beautiful sections, and the plants produce flowers in great abundance, mainly in early summer, and occasionally a few odd blooms in late summer. This is also the case with some of the German irises.

The Japanese iris is a lime-hater, and no lime whatever must be given to it. It has been usually accepted that this iris must be grown in mud, or at least with abundance of water. This is quite wrong, as any of the Japanese irises, and there are many beautiful varieties, will flower in a good loamy soil among other plants in the flower border, provided a reasonable amount of water is given. Other summer-flowering irises are *Iris ochroleuca*, and *Iris Monnieri*, and *Iris aurea*. These are evergreen, growing in clumps with long leaves, the flowers being carried on long stems, which are frequently from 3 to 4 feet in height. The first-named is white and gold, the second yellow, and the third golden-coloured.

The Spanish and English irises, and also the new Dutch iris family, belong to the bulbous section which flowers in spring and early summer, and which lose their leaves in the winter. These are very fine, grown in clumps, and many colours and shades, ranging through browns, purples, yellows, blues, and whites, are to be obtained.

GENERAL.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap, they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as azaleas, rhododendrons, liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower

on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are *Lasiandra*, *Lantana*, *Cestrum*, *Tecoma*, *Hydrangea*, *Plumbago*, *Erythrina* (some species), &c., and those that should not be touched at present are *Spiræa*, *Erythrina* (some species), *Pyrus Japonica*, *Weigelia*, *Prunus pissardi*, *P. Vesuvius*, *P. mume*, *Deutzia*, *Polygala*, *Ceanothus*, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged and untidy appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as salvia, aster, delphinium, polygonium, boltonia, gaura, and chrysanthemum, should be cut back, and, if necessary, lifted and heeled in a temporary location for the winter. Plant out gladioli, iris, and liliums

Continue digging, manuring, and trenching.

COMPARATIVE VALUES OF STOCK FOOD.

The best way to estimate the comparative value of the different food stuffs available is on the basis of current price per unit of food nutrients. This is arrived at in the following manner:—

Percentage of protein, plus fat multiplied by 2¼, plus carbo hydrates, divided into market price.

EXAMPLE.

Linseed Oilcake.

				Market price per ton. £ s. d.	
Protein	.. 26·1% }	= 32·6 x 2¼ =	81·5 food units		
Fat	.. 6·5% }				
C.H.	.. 38·5%	..	38·5		
			120·0 food units	12 0 0	= 2s. per unit.
Usual market price		.. ..	..	11 0 0	= 1s. 10d per unit.

Bran.

Protein	.. 11·2% }	=13·7 x 2¼ =	34·25 food units		
Fat	.. 2·5% }				
C.H.	.. 42·2	. .	42·2		
			76·45 food units	10 5 0	= 2s. 8d. per unit.
Usual market price		. ..	..	5 0 0	= 1s. 3½ per unit.

Oaten Hay.

Protein	.. 4·5% }	= 6·0 x 2¼ =	15·0 food units		
Fat	.. 1·5% }				
C.H.	.. 43·7%	..	43·7		
			58·7 food units	10 0 0	= 3s. 5d per unit.
Usual market price		.. ..	..	2 10 0	= 10¼d. per unit.

Molasses.

Protein	.. ·7% }	= ·84 x 2¼ =	2·10 food units		
Fat	.. ·14 }				
C.H.	.. 53·68	.. ..	53·68		
			55·78 food-units	8 0 0	=2s. 10¼d. per unit.

Food Contents of Foods Available.

—	Protein.	Carbo hydrates.	Fat.
HAY—			
Lucerne	12·3	37·1	1·6
Oat	4·5	43·7	1·5
Rye Grass	6·1	37·8	1·2
Tare	12·9	37·5	1·4
Wheat	3·6	46·1	1·1
STRAW—			
Barley	·7	41·2	·6
Oat	1·2	38·6	·8
Pea	4·3	32·3	·8
Wheat	·4	36·3	·4
GRAIN—			
Barley	9·6	63·5	2·1
Maize	7·8	66·7	4·3
Oats	9·2	47·3	4·2
Wheat	13·7	47·6	1·4
PRODUCTS—			
Brewer's Grains	3·9	9·3	1·4
Cocoanut Oilcake	16·4	42·2	9·1
Linseed Cake	26·1	38·5	6·5
Malt Combings	26·1	50·6	1·5
Oat Branning	9·6	54·1	5·5
Bran	11·2	42·2	2·5
Pollard	12·2	53·4	3·8
ROOTS, ETC.—			
Beet Pulp	·6	7·3	·0
Sugar Beet	1·6	11·9	·1
Cabbage	1·8	8·2	·4
Carrots	·8	7·8	·2
Mangolds	1·1	5·4	·1
Pie Melon	·7	3·5	·6
Pumpkins	1·0	5·8	·3
Turnips	1·0	7·2	·2
Potatoes	·9	16·3	·1

PIG FEED.

As pig feed of all descriptions is now so high in price the following will be a guide as to whether pork can be profitably raised. The price of all meat is likely to be high for some time to come:—

BASING THE VALUE OF CARCASS PORK AT 6D. PER POUND.

Amount of food required to produce a lb. of pork.	Lbs. of feed.	Will produce lbs. of pork.	Value per gallon, ton, or bushel.	Value of food per lb.
30 lbs. Skim milk	..	1	2d. per gallon	..
20 ,, Potatoes	2·240	112	56s. per ton	·3d.
5 ,, Barley	50	10	5s. per bushel	1·2d.
5 ,, Oats	40	8	4s. per bushel	1·2d.
5 ,, Wheat	60	12	6s. per bushel	1·2d.
5 ,, Pollard	20	4	2s. per bushel	1·2d.
5 ,, Maize	56	11·2	5s. 6d. per bush.	1·2d.

Lucerne should be made more use of for pig feed. It has been proved by experiment that lucerne cut when just coming into bloom $2\frac{1}{3}$ lbs. is equal to 1 lb. of grain. If cut late it takes 6 lbs. to equal

1 lb. of grain. Practically only the leaf is of value for pigs, the stalk being too fibrous. The lucerne chaffed should be mixed with grain feed and soaked for twelve hours or more.

REMINDERS FOR AUGUST.

Live Stock.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the day-time when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Calves should be kept in warm, dry shed. Those on the bucket should be given their milk warm. The bull may now run with the cows.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and the feeding troughs clean and wholesome. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run.

Sheep.—Ascertain what Merino and Lincoln rams will be required for the coming season, and apply to breeders this month. Cull stud ewes carefully, retain only the very best, pedigree alone is not sufficient, individual merit as well must be considered, the one is inseparable from the other. Market any aged fat ewes that have missed rearing a lamb, prices are unprecedented, no need to be prime mutton. Unless holdings are of insufficient area all best early born ewe lambs should not be sold for slaughter. Good ewes will be practically unprocurable later. Retain all good ewes under four years old.

Poultry.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule or thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

Cultivation.

Farm.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

Orchard.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur spray.

Flower Garden.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

Vegetable Garden.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply 1st acid iron sulphate treatment (see *Journal* for July, 1911). Apply readily soluble nitrogenous manures (soda nitrate or ammonium sulphate) during this month.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 8. 10th August, 1915.

DRY-FARMING INVESTIGATIONS IN THE UNITED STATES.

By Lyman J. Briggs, M.S., Ph.D.

In charge of Biophysical Investigations, United States Department of Agriculture.

Presented before Section M of the British Association for the Advancement of Science, Melbourne, Australia, 1914.

The term "dry-farming" is now generally applied to agricultural practice in regions where rainfall is the primary limiting factor in crop production. The determination of the tillage methods which are most efficient in the storage and conservation of moisture, and the development of varieties which are specially suited to dry-land conditions, are economic problems worthy of the best efforts of the agronomist. The most efficient methods are not always the most profitable methods, for the margin of profit in dry-farming is normally small, and the cost of tillage must always be compared with the return. Efficiency in the use of the limited rainfall is, however, the basis upon which dry-farming practice must be built.

Before taking up the discussion of dry-farming investigations in the United States, a word regarding the organization of the Department of Agriculture in this connexion may be of interest. Five offices in the Bureau of Plant Industry are devoting a large part of their energies to dry-farming problems. The Office of the Dry Land Agriculture operates over a score of experimental farms in various sections of the Great Plains. This office is concerned chiefly with the determination of the crop rotations and tillage methods which are best adapted to the various dry-farming sections. It was early recognised in the development of this work that dry-farming problems are often of an extremely

local character, and that numerous experimental stations are necessary to cover the field. Each experimental farm is superintended by a trained agriculturist, usually an agricultural college graduate. These farms also afford experimental facilities for other offices engaged in dry-farming problems. The offices of the Cereal Investigations, Forage Crop Investigations, and Alkali and Drought Resistant Plant Investigations, are engaged in the investigations of crops suited to dry land conditions: while the Office of Biophysical Investigations, in co-operation with the above-named offices, is concerned with the study of the influence of various tillage methods on the absorption and retention of rainfall, the water requirement of crops under field conditions, and the influence of climatic conditions on the growth of dry-land crops. Over £50,000 is now appropriated annually by Congress for the support of the dry-land work. In addition to this, several of the States are also conducting dry-farming investigations on an extensive scale, either independently or in co-operation with the Government The field of investigation is so extensive that the present paper will be confined largely to the biophysical phases of the work.

Dry-farming Areas in the United States.

Two great dry-farming areas occur in the United States. One, the inter-mountain area, lies between the Rocky Mountains on the east and the Sierra Nevada Mountains on the west. It is essentially a region of winter and spring rainfall. The other, the Great Plains area, extends from the Canadian boundary along the eastern side of the Rocky Mountains nearly to the Mexican boundary, and embraces over 200,000 square mile of land whose productivity is limited by the rainfall. This area, in contrast to the other, is a region of summer rainfall.

These two great areas differ greatly in their physiographic features and in their native plant cover. The inter-mountain district is broken into numerous valleys, and the vegetation consists mainly of shrubby perennial plants, such as the sagebush (*Artemisia tridentata*) (Plate I.), and a salt-bush (*Atriplex confertifolia*). The size and character of this vegetation affords a good index of the productivity of the the land* The larger the sagebrush the greater the water supply, and the better the farm. The soils occupied by salt-bush, on the other hand, are apt to be so saline in character as to be unsuited to dry-farming.

In the Great Plains no trees or shrubs are found, except along the water-courses, while the gently undulating grass-covered plain stretches unbroken to the horizon, save for the buildings of the settlers. Much of this country is covered with buffalo grass (*Buchloë dactyloides*) and grama grass (*Bouteloua oligostachya*), while farther to the east, where the rainfall is somewhat heavier, the taller bunch grass (*Andropogon scoparius*) and wire grass (*Aristida longiseta*) make their appearance.†. This striking difference in the vegetation, characterized by the shrubby plants in the inter-mountain districts, and by grasses on the plains,

* Indicator significance of vegetation in Tooele Valley, Utah. Kearney, Briggs, Shantz, McLane, and Piemeisel—*Journal of Agricultural Research, United States Department of Agriculture*, I., page 365, 1914

† Shantz, H. L. Natural vegetation as an indicator of the capabilities of land for crop production in the Great Plains area.—*United States Department of Agriculture, Bureau of Plant Industry*,

reflects the difference in the distribution of the annual rainfall, which has had a marked effect upon the dry-farming development of the two sections

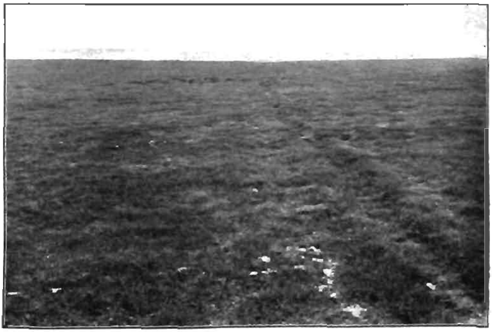


Plate 1.—Showing the native sagebush vegetation on virgin land in the intermountain district (above), and the short-grass vegetation of the virgin Great Plains (below). The Intermountain district has a winter rainfall and the Great Plains a summer rainfall. (Photographed by H. L. Shantz.)

Rainfall.

It has become customary to use the average annual rainfall as a measure of the relative value of different areas for dry-farming purposes. Since the water supply is usually the primary limiting factor, the annual rainfall must of course be emphasized. All who are engaged in dry-farming investigations recognise, however, the severe limitations of this classification. The seasonal distribution and the character of the rainfall—whether torrential, or in the form of numerous light showers, or occurring as steady soaking rains—are often more important than the total annual rainfall in determining the productivity of a dry-farming region. The uncertainty of the rainfall should also be considered whenever sufficient statistical evidence is available.

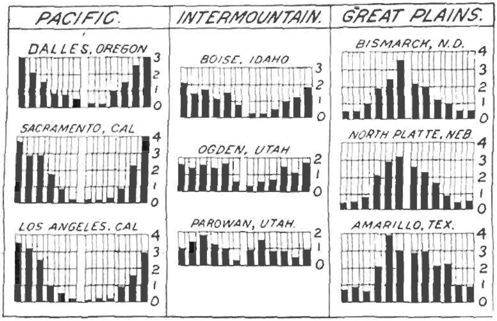


Fig. 1.—Chart showing the monthly distribution of the rainfall at representative stations in the Great Plains, inter-mountain, and Pacific coast regions. The length of the black lines in each diagram represents the monthly precipitation at that place, beginning with January on the left. The scale in inches given on the right of each diagram can be used to find the actual amount of the monthly rainfall. For example, the average monthly rainfall at Bismarck, N. Dakota, for June is seen to be 3¼ inches, while for July it is only a little more than 2 inches. It will be noted that in the Pacific coast region the rain comes principally at the beginning and end of the year, that is, in winter; in the inter-mountain districts, during winter and spring months; and in the Great Plains during the summer months.

Rainfall is not the only factor of importance, however. We shall refer later to the desirability of knowing the seasonal evaporation as measured from freely-exposed tanks, which affords a summation of those factors which determine the rate of transpiration. The maximum temperatures and the wind velocity are also important factors. For an adequate comparison of widely-separated dry-farming areas, a knowledge at least of the annual rainfall, its seasonal distribution, the seasonal evaporation, and the depth and character of the soil appears to be

Reference has already been made to the striking difference in the *monthly distribution* of the rainfall in the Great Plains as compared with the inter-mountain districts. This difference is illustrated in Figure I., which shows the monthly distribution of rainfall at representative stations in each area. Three Pacific slope stations, with a distinctly winter type of rainfall, are also included. In this latter region, owing to the mildness of the climate, an annual crop of wheat is grown during the winter months either for grain or hay.

Grain farming under the alternating fallow and cropping system has been satisfactorily established in Utah, where the annual rainfall is 13 inches or more. In the southern part of the State of Washington, where the conditions are unusually favorable, land with an annual rainfall as low as 10 inches is used for growing winter wheat by the summer-fallow method.* but the returns are uncertain. When the *annual rainfall is reduced to 8.5 inches, the crop will barely return the* cost of production.

The rainfall required when the rain comes chiefly in the summer is higher than for winter rainfall. This appears to be due to the greater evaporation-loss from the fallow when wet frequently by summer rains. In the Great Plains, where a summer rainfall prevails, dry-farming is not successfully conducted on an annual rainfall less than 14 inches, and this minimum is still higher in the southern part of the area, due, as we shall see, to the higher rate of evaporation.

Evaporation.

The evaporation-rate may fairly be considered as ranking next in importance to the annual rainfall in determining the dry-farming possibilities of a region. The evaporation from a free water surface represents a summation of the intensity of solar radiation, temperature, saturation-deficit, and wind velocity, all of which enter also into the determination of the transpiration-rate of the growing crop, though not necessarily in the same proportion as in free evaporation. Evaporation has been measured daily during the summer months at each of the experimental farms located in the dry-farming sections. Tanks 6 or 8 feet in diameter and 2 feet deep are used, the tanks being sunk in the ground to within 4 inches of the top. The free water surface is maintained at ground level, *i.e.*, about 4 inches from the top of the tank. Observations are now available for seven years at the stations first established. The observations are limited to the six months from April to September inclusive, since freezing weather is encountered at the stations during most of the remaining months. The average seasonal (April to September inclusive) evaporation in inches for each station, together with its location, is shown on the accompanying map (Figure 2). The evaporation increases rapidly as one proceeds southward in the Great Plains; the evaporation in northern Texas, for example, is 54 inches, compared with 31 inches in the central part of North Dakota. Such differences have a profound influence upon the water requirement of plants.

Shantz† has shown that under practically uniform soil conditions a pure short-grass formation is found in northern Texas, with an annual

* Briggs, L. J., and Belz, J. O. Dry-farming in relation to rainfall and evaporation.—United States Department of Agriculture, Bureau of Plant Industry, Bulletin 188, page 25.

† Shantz, H. L. Natural vegetation as an indicator of the capabilities of land for crop production in the Great Plains area.—United States Department of Agriculture, Bureau of Plant Industry Bulletin 201, page 12.

rainfall of about 21 inches; in eastern Colorado, with an annual rainfall of about 17 inches; and in Montana, with an annual rainfall of approximately 14 inches. The region throughout has a summer rainfall. The same plant formation then requires 50 per cent. more rainfall in northern Texas than in Montana. The explanation of this is to be found in the difference in the evaporation-rate in the two sections. Reference to Figure 2 will show that the evaporation in northern Texas is approximately 60 per cent. higher than in central Montana. A similar comparison between northern Texas and north-eastern Colorado shows that short grass requires about, approximately, 27 per cent. more rainfall in northern Texas, where the evaporation is 23 per cent. higher than in north-eastern Colorado. The effectiveness of rainfall depends, of course, upon its penetration into the soil, so that any relationship

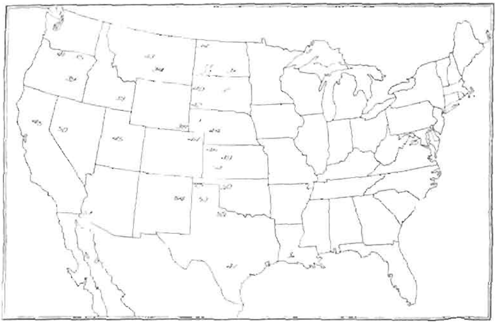


Fig. 2.—Map showing stations at which evaporation measurements are being made by the Office of Biophysical Investigations. The figures show the evaporation in inches during the six summer months (April to September inclusive). It will be seen the evaporation in the southern part of the Great Plains is nearly twice that in the northern part.

which may be developed between evaporation and precipitation will necessarily be an approximate one. The above figures indicate, however, a rather close parallelism between the evaporation and the rainfall required to maintain a given plant formation, and emphasizes the necessity of knowing the evaporation as well as the rainfall in judging the dry-farming possibilities of a region.‡

A direct relationship between evaporation and water requirement, *i.e.*, the pounds of water required by a plant in the production of a pound of dry matter, is shown in the following measurements by Briggs and Shantz of the water requirement of the same strain of alfalfa when grown in different parts of the Great Plains (Table I.).

‡ Briggs, L. J., and Belz, J. O.—Bureau of Plant Industry, Bulletin 188, 1911, page 20.

TABLE I.—WATER REQUIREMENT OF GRIMM ALFALFA (SECOND CUTTING) AT DIFFERENT STATIONS IN THE GREAT PLAINS, 1912.

Location.	Growth period.	Days.	Water requirements.	Evaporation in inches.	Daily evaporation in inches.	Ratio of water requirements to evaporation daily.
Williston, N.D.	July 29–Sept. 16	47	518 12	7.5	0.159	33
Newell, S.D. ..	Aug. 9–Sept. 24	46	630 8	8.6	0.187	34
Akron, Col. ..	July 26–Sept. 6	42	853 13	9.5	0.226	38
Dalhart, Tex...	July 26–Aug. 31	36	1,005 8	11.0	0.306	34

It will be seen that the water requirement increases steadily as one proceeds southward through the Great Plains, being twice as great in northern Texas as in North Dakota. The daily evaporation also increases in a corresponding manner, so that the ratio of the water requirement to the daily evaporation is approximately constant. Montgomery and Kiesselbach* have shown that maize grown in a dry house and a humid house varied in its water requirements exactly in proportion to the relative evaporation-rates in the two houses.

The water requirement is not, however, always proportional to the evaporation. Other factors, such as temperature, may have a profound influence in determining the development of the plant. This may be illustrated by comparing the water requirement of wheat and sorghum in Colorado and in northern Texas (Table II.).† When the difference in evaporation is considered, sorghum is seen to have made a more efficient use of its water supply in Texas than in Colorado, while the reverse is true in the case of wheat.

TABLE II.—COMPARISON OF THE RELATIVE EVAPORATION AND OF THE RELATIVE WATER REQUIREMENT IN THE GREAT PLAINS IN 1910 AND 1911.

Station.	Year.	Crop.	Growing period.	Evaporation.		Water requirement.	
				Actual.	Relative.	Actual.	Relative.
Akron, Colo...	1910	Wheat..	April 18–Aug. 2	37·7	100	664	100
Amarillo, Tex.	..	..	April 5–July 19	34·0	122	853	128
Akron, Colo...	1910	Sorghum	Hay 25–Sept. 28	33·0	100	356	100
Amarillo, Tex.	..	..	May 10–Aug. 28	37·7	114	359	101
Akron, Colo...	1911	Wheat..	May 13–Aug. 2	24·8	100	468	100
Dalhart, Tex.	..	..	April 25–July 18	28·5	115	673	143
Akron, Colo...	1911	Sorghum	May 12–Sept. 4	35·0	100	298	100
Dalhart, Tex.	..	..	May 14–Sept. 12	41·9	120	313	105

* Studies in the water requirement of corn.—Nebraska Agricultural Experiment Station Bulletin 128, 1912.

† Briggs, L. J., and Shantz, H. L. Water requirement of Plants, I.—United States Department of Agriculture, Bureau of Plant Industry, Bulletin 284, page 45.

(*To be continued.*)

BUTTER AND BEEF.

RED POLLED MILKERS.

Government Importations.

The success which has attended the efforts of the Department of Agriculture in building up the high-yielding breed of Red Poll dairy cows now stationed at the State Research Farm, Werribee, has encouraged the Government to augment the locally-bred stock by the introduction of selections from the best herds of England, and six typical representatives of the modern dairy type of the breed are due to arrive by the s.s. *Dorset* during the course of the month.

When Mr. W. A. N. Robertson, Chief Veterinary Officer, was commissioned by the Federal Government to represent the Commonwealth at the International Veterinary Congress in August last, the Director of Agriculture (Dr. S. S. Cameron) suggested that Mr. Robertson

Red Polls in English Meadow.

The Hon. the Marchioness of Graham's select Red Poll milkers. Herd average, 1913, 6.443 lbs.

should be intrusted with the selection and purchase of the best specimens of the dairy type of Red Polls obtainable in England. Financial provision was obtained. It was known that the Red Poll Herd Book Association of Great Britain had for upwards of twenty years been paying the utmost attention to the development of the dairying characteristics of the breed, which had previously depended for its popularity on three very desirable characteristics, viz., hornlessness, soundness, and hardiness of colour and constitution and quick fattening.

Their efforts in this direction have been such that the development of a dual purpose breed is no longer a matter of speculation, but a definitely proven fact attested by the magnificent dairying results shown in the Association's Herd Test and published from year to year in the Herd Book, along with the annual prize records in fat stock and beef classes at Smithfield, the Royal, and other English shows.

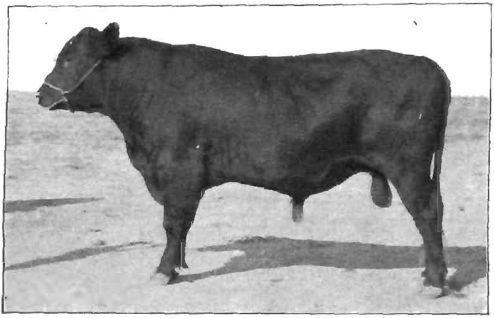
Mr. Robertson returned to Melbourne last week, and from particulars furnished it would appear that he has succeeded in his mission almost beyond expectation. It will be a surprise to most Australian

"Primrose League" (imp.).

"Velveteen" (imp.).

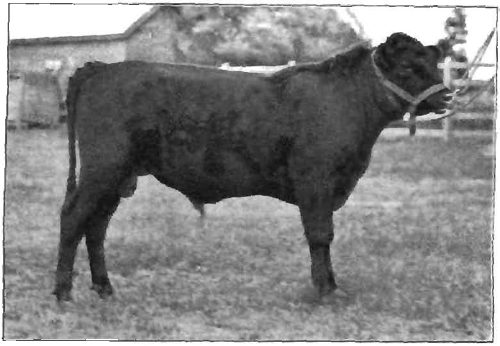
dairymen, who usually confine themselves to the Ayrshire, Jersey, and Shorthorn breeds of dairy cattle, to learn that the Red Poll in England puts up records for milk yield fully equal to those of the more popular

dairying breeds just mentioned; but the milk records of the ancestors back to the seventh generation of some of the animals Mr. Robertson *has succeeded in purchasing leave no room for doubt.*



"Longford Major" (imp.) 2 years old.

Imported by the Department of Agriculture, Victoria. Dam's record, 1,471 gallons; average over 6 years, 1,138 gallons.



"Belligerent" (imp.) yearling.

Imported by the Department of Agriculture, Victoria. (The milk records of nine of the female ancestors of this young bull average over 1,000 gallons of milk per annum, extending over from 2 to 12 lactation periods—average of seven years.) (See table in text.)

For wealth of milking pedigree, first mention should be made of the young bull "Belligerent," the second calf of a dam "Meadow Rubicon," which yielded 7,144 lbs. (714 gallons) on her first milking, and whose dam in turn has a record for one lactation period of 14,533 lbs. (1,453 gallons), and a continuous average for her first four calvings of 12,871 lbs. (1,287 gallons). This cow, "Flaxmore Ruby," had calved a couple of months before Mr. Robertson's inspection, and she was then yielding 72 lbs. (7 1-5 gallons) a day, and bidding fair to surpass her previous best record. Being a comparatively young, fresh cow, an attempt was made to buy her; but no offer within reason would tempt the owner, and Mr. Robertson had to be satisfied when his persuasive efforts enabled him to get hold of her grandson.

On the sire's side, Belligerent's pedigree is even stronger in milking forbears, as will be seen from the following tabulation of records for seven generations back:—

——	Milk Record.	Annual Average.	Years Recorded.
Belligerent.	lb.	lb.	
Dam, Meadow Rubicon	7,144	(1st calf)	
G.-dam, Flaxmoor Ruby	14,533	12,871	4
Sire's dam, Meadow Blush 3rd	10,370	9,354	7
Sire's g.-dam, Meadow Blush 2nd ..	9,510	8,033	12
G.-sire's dam, Kitchener	7,024	(1st calf)	
G.-sire's g.-dam, Kitchener's Daffodil ..	10,215	9,386	7
G.-sire's g.g.-dam, Daffodil	10,176	8,827	5
G.g.-sire's dam, Berry	12,565	8,853	10
G.g.g.-sire's g.-dam Ripe Pear	10,008	9,754	2
Average milk record of 9 ancestors ..	10,161	9,708¼	7

Rack feeding of hornless milkers (Werribee Research Farm).

Belligerents apparently must have allies nowadays, and there comes with the yearling a two-year-old "Longford Major," which Mr. Robertson purchased from the Marchioness of Graham, who bought him from the Earl of Radnor on the day he was calved, on account of his dam's

milking fame. This bull is equally likely to intensify the dairying characteristics of the Government herd. *His dam, Mona, is the crack* cow of the Longford Castle herd, and has a lactation record of 14,713 lbs. (1,471 gallons), with an average over six consecutive years of 11,388 lbs. (1,138 gallons), while on her last calf she averaged 36 lbs (3 3-5 gallons) of milk daily for 361 days. Longford Major's grand-dam, Minnie, has a lactation record of 10,548 lbs. (1,054 gallons), and a four years' average of 9,135 lbs. (913 gallons).

As indicated in the attempt to buy Flaxmoor Ruby, the present stars among the Red Poll milkers in England were very firmly held, and Mr Robertson had to be satisfied for his females with cows of authoritatively recorded milking descent, but which themselves had not reached their *prime as milkers. His instructions were to take nothing on chance;* so many promising heifers were passed by, and only cows doing their second *and third lactation periods, whose actual milking capacity could be* personally checked, were selected.

The cows to arrive are:—

—	Milk Record.	Annual Average.	Years Recorded.
	lb.	lb.	
1.—Primrose League	5,035 (1st calf)		
Dam: Primrose	8,179	7,826	3
G.-sire's g.-dam: Ripe Pear ..	10,088	9,754	2
2.—Velveteen	6,475 (1st calf)		
Dam: Fustian 2nd	8,336	7,587	3

Dr. Cameron is pleased with the way in which Mr. Robertson has carried out his mission, and is more certain than ever that the Red Poll breed will quickly challenge the other dairying breeds for supremacy. Dr. Cameron, when Chief Veterinary Officer, was responsible for the establishment of the Red Polls under Government management, and he still exercises direct personal control of the breeding operations at the State Research Farm at Werribee. He was thought to have taken a considerable risk in departing from the beaten track as regards the variety of cattle chosen to establish the first Government dairy herd, from which milk record-bred bulls were to be distributed, but the practical advantage of the hornless prepotency of the Red Polls appealed to him, and his confidence in the milking potentiality of the breed has been amply justified. In competition under standard herd test conditions with the leading herds of other breeds in the State, the Red Polls last *year occupied fifth place* among heifers, *seventh and ninth places in* the four-year-old division, and twenty-third place in the class for aged *cows of all breeds.*

Dr. Cameron points out that when the new importations are mated with the present herd the progeny will probably have a more extensive milking record pedigree than any other breed or herd in the State, for the milk yield of every cow in the Government herd has been recorded daily and published annually for the past five years, while it is unlikely that any other herd can show progeny from cows so recorded and sired by bulls whose female ancestors have recorded and published yields for seven generations.—Reprinted from *Weekly Times.*

PRUNING THE OHANEZ AND SOME OTHER "SHY BEARING" VINES.

By F. de Castella, Government Viticulturist.

Owing to the remarkable keeping quality of its fruit under cool storage conditions, which makes it the most reliable shipping grape, the Ohanez vine is attracting much attention at the hands of intending vine growers, especially in our northern irrigation districts, where the growing of grapes for export in the fresh state appears to be a coming viticultural industry of very great promise.

This vine seems to require special treatment in the way of pruning if satisfactory yields are to be expected from it. It is true that our practical experience of this variety, on anything like a large scale, is as yet very limited; nevertheless a certain amount of information has already been collected in connexion with the manner in which it produces its fruit, the logical outcome of which is the system of pruning about to be described, a system which differs very considerably from that at present applied to any vine we now cultivate.

The Ohanez vine has long had the reputation of being a shy bearer. Several Victorian growers who have for many years cultivated a few vines of this variety under the incorrect name of Almeria* complained of its poor yield. In Spain it is held to need artificial pollination, either with pollen from another variety or even with that of its own flowers.† According to recent experience in this State, the cause of the small yield does not appear to be faulty constitution of the flower so much as an *insufficient production of flower buds. Those which do make their* appearance in spring usually set quite normally, furnishing well filled bunches; it is the number of these, however, which is insufficient.

Scanty yield in a vine may arise in several different ways: there may be an abundant "show" of fruit in the early spring—in other words a very free production of the green, somewhat cauliflower-like processes, which constitute the embryo bunches and which usually come into flower in early November. Failure to "set" the fruit, or *coulure*, as it is termed in French, may result in little or no fruit remaining on the vine at vintage time. This may happen in different ways. There may be more or less complete dropping off of the flower buds before blossoming time. In other cases the flowers blossom in most promising fashion, yet fail to set or only set the fruit very incompletely. In other cases, again, the flowers appear to set satisfactorily, but the berries drop off to a greater or lesser extent when they have attained the size of small shot. The first of these visitations is mainly climate—it was only too common during the disastrous spring of 1914; some varieties (Malbeck, Clairette, &c.) are more prone to it than others. The second is often due to faulty pollen, and may be corrected by interpollination;

* ALMERIA is the name of the Spanish town whence grapes of the OHANEZ variety are so largely shipped. To use the name of this town to describe Victorian grapes is contrary to international law, and dangerous as well as illogical. It would constitute a misuse of a "regional appellation," and, as such, be contrary to the provisions of the Washington Convention of 1911, to which Great Britain is one of the contracting States. Grapes offered for sale in England under the name of ALMERIA would, therefore, be liable to seizure and confiscation. To avoid such risk the name OHANEZ should be used.

† See *Journal* for September, 1908, p. 549.

Raisin des Dames or Bicane and several other table grapes suffer in this way. The third usually responds to the cincturing which is so extensively applied to combat it in the case of the Zante currant. Late pruning, stopping (or nipping), interpollination, sulphuring and cincturing are, in fact, the standard treatments recommended for vines which set their fruit in an unsatisfactory manner.

The shy bearing of the Ohanez is of a quite different order. When pruned in the ordinary way it fails to produce flower buds, or at least forms very few of them: in other words, the show of fruit is unsatisfactory. In such a case it is evident that no spring or early summer treatment *can lead to an increase of crop; it is at the winter pruning that* steps must be taken to guard against the trouble. The case is similar, though not entirely so, to that of a vine requiring long pruning. I such a vine—a Sultana for example—be pruned short the show of fruit will be insignificant, and no summer pruning operation can cause it to yield grapes in the autumn. As all practical vine pruners know well,

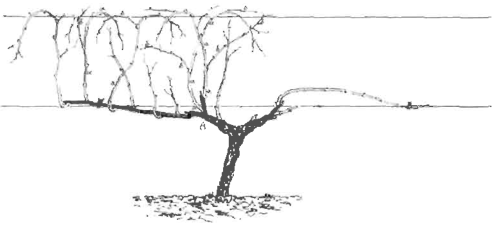


Fig. 1.—Ordinary long pruning with two rods, known as the double "Guyot" system. The right-hand side of this vine has been pruned, the left-hand side has not. The growth of the previous year's spur at *A* will furnish rod and spur as on the right-hand side.

the canes of varieties which demand long pruning have their fruitful eyes situated at some distance from their base. If such a vine be spur pruned the only eyes left on it are the more or less barren ones near the base of the canes, hence the failure to produce crop.

With Ohanez, even the long pruning, which extracts such abundant crops from the Sultana, is not sufficient to ensure a satisfactory yield, for the reason that the most fruitful buds are not situated on any part of the main or primary canes, but on the lateral canes which grow off them. In order to obtain abundant fruit it is not only necessary to prune the Ohanez long, in other words to rod prune it, but *the rods on which the fruit will be borne should consist of lateral growth.*

In order to render this clear to beginners it may be well to further explain with the aid of a few diagrams. Fig. 1 represents a vine pruned long, according to the ordinary method with two rods, usually known as double "Guyot" pruning—what is usually termed in South Australia the Bordelais Spalier. In the vine here represented the right

half has been pruned whilst the left half has not. The cuts required in order to prune the left hand side of this vine are evident at a glance. The previous year's rod, together with the canes which have sprung from

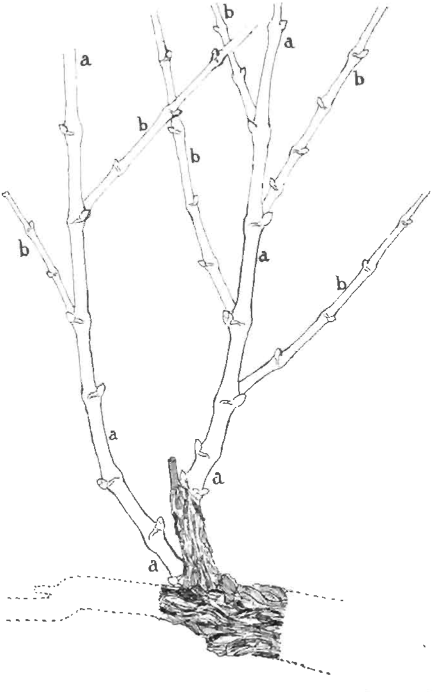


Fig. 2.—Growth of spur at *A*, Fig. 1, as it would be in the case of a vine variety which produces laterals freely. *a*, *a*, *a*, are main canes; *b*, *b*, *b*, are laterals.

it, will be entirely removed, the previous year's spur (situated at the apex of the letter A), furnishing the new spur and the new rod. In this case the rods are chosen from main canes such as *a*, *a*, any lateral

growths which may be situated on them being entirely removed. In the case of Ohanez, however, it is these very laterals which we shall use to constitute our new rods.

What is a Lateral?

Though the definition may be needless to an experienced pruner, it may here be explained that a lateral is a cane growing off a main or primary cane during the same season. *A lateral is thus of the same age as the cane off which it grows.* The green or herbaceous vine shoot sent out from a previous year's bud has its leaves situated alternately *on opposite sides of the cane.* In the axil of each leaf there is a large bud which remains dormant during the growing season, but which will produce a new primary cane the following year. In addition to this large bud, there are several less noticeable ones. Two or three of these are latent buds, which only develop the following season in case of *damage to the main bud.* It *is these which provide the secondary* growth, often bearing some fruit, in cases where the shoot from the main bud has been destroyed by frost. All these, however, are buds which only develop during the season following their formation. In the axil of each leaf there is another bud which usually develops a season earlier, that is to say during the season of its formation. The canes issuing from these buds are laterals, and it is on them that are to be found, in the case of the Ohanez vine, the really fruitful buds.

Referring again to Fig. 1, the spur at the apex of the letter A will be seen to have sent out two main canes, *a*, *a*, *a*, *a*, each of which has in turn thrown laterals *b*, *b*, *b*. The production of laterals in this case is not considerable: it usually happens that they are much more numerous. The spur shown in Fig. 1 may, for example, grow as in Fig. 2, *in which the canes marked a, a are main canes and those marked b, b* are laterals. Certain vine varieties produce laterals freely; Ohanez, in fact, belongs to this type. As will be explained presently the formation of laterals can also be stimulated by a simple method of summer pruning.

Lateral Rods.

In the case of abundant lateral production such as is shown in Fig. 2, there is no difficulty about pruning to lateral rods. Fig. 3 shows a vine thus pruned. The right hand side of this vine bears the rod *a*, *c*, and the spur *s*. The rod is a composite one: the portion *a*, *b* being main cane and the portion *b*, *c*, lateral growth. It is important to remember that the whole of this rod is of the same year's growth: the portion *a*, *b* is not, as might at first sight be thought, a season older than the lateral part *b*, *c*.

Lateral canes are necessarily weaker than main ones; they may occasionally be rather too weak for a single one to serve for a rod. In such a case two laterals may be brought down to do the duty of one stronger one, as shown on the left hand side of Fig 3. The rods are, after all, only annual expedients for fruit production: they do not form part of the permanent framework of the vine, but will be entirely removed at the following pruning.

Fig. 4 will *give some idea of the fruit production of the right hand* half of Fig. 3. It will be seen that whilst the buds of the lateral portion of the rod *f*, *g*, *h*, *k*, *l*, *m*, *n*, have produced numerous embryo bunches, scarcely any are to be seen on the shoots sent out from the buds *a*, *b*, *c*, *d*, *e*, or from those on the spur, *s* and *r*.

PROVISION FOR LATERALS.

The Ohanez vine usually produces laterals freely; more so than most other table grapes This is, in fact, the main reason why this variety suffers less than many others from sunburn. Its fruit is well protected

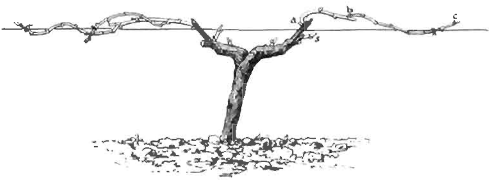


Fig. 3.—Long pruned vine with rods consisting mainly of laterals. The portion a, b is main cane, whilst b, c is a lateral.

by the abundant lateral growth. By the judicious application of a little summer pruning it is easy to provide all the laterals which may be required at the following winter pruning. The suppression of the terminal

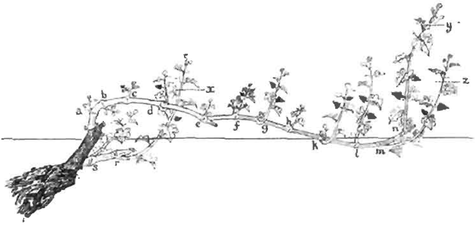


Fig. 4.—Summer pruning to supply lateral growths by "stopping" shoot r at x. The stopping of shoots m and n at z and y is also recommended. It improves the fruit and tends to equalize growth in shoots nearer the vine—b, d, f, g, h, k, and l. Shoots a, c, and e, which bear no fruit, have been removed or "disbudded."

bud of a growing cane has a remarkable effect on its further development. The first effect of the check is to throw the growth back to buds situated nearer to the main stem of the vine. After a while, growth is resumed by the stopped cane, in the shape of the development of laterals.

Referring again to Fig. 4. The spur will be seen to have given rise *to the shoots r and s. These will provide the rod and spur required for* the following year's pruning. By suppressing the terminal portion of the shoot *r*, as shown in Fig. 4, we can bring about the production of

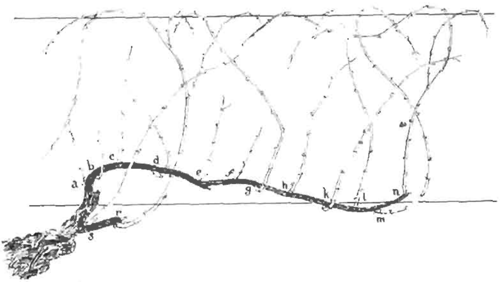


Fig. 5.—Growth resulting from Fig. 4 at the end of the season—as it would be if no summer pruning had been practised.

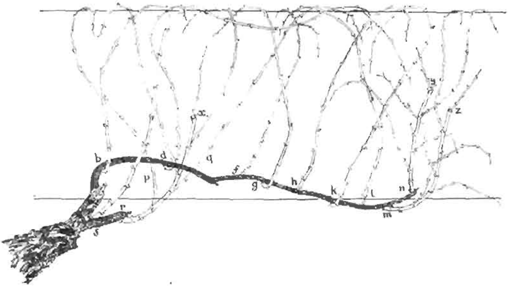


Fig. 6.—Growth resulting from Fig. 4, showing the marked effects of summer pruning. The stopping of shoot *r* at *x* has caused it to throw strong laterals, of which *p* and *q*, or both of them, may be used as lateral rods. Stopping *m* and *n* has caused them to produce laterals, and has strengthened the growths of *b*, *d*, *f*, *g*, *h*, *k*, and *l*.

several lateral canes for winter pruning. Fig. 5 shows the growth resulting from Fig. 4 if it were left untouched. Fig. 6 shows the effect of a little summer pruning applied to the same vine. It will be observed that in Fig. 5 the cane *r* has not produced laterals to any extent, whereas

in Fig. 6 the suppression of the growing tip at *x* (Fig. 4) has resulted in the growth of strong lateral shoots, either *p* or *q* of which may be utilized to form the new lateral rod.

The stopping of shoot *r* (Fig. 4) has also resulted in shoot *s* growing more vigorously, and therefore supplying a better spur for the subsequent pruning.

The suppression of the tips of the shoots from *m* and *n* (at *y* and *z*, Fig. 4) will be seen to have modified their growth in a similar manner (compare Figs. 5 and 6). Though such treatment is not applied with the object of providing laterals for pruning, it is strongly to be recommended, and will amply repay the trifling amount of labour entailed. If stopped at *y* and *z* (Fig. 4) not only will the fruit borne by these canes be improved, but the growth will be thrown back into *b*, *d*, *f*, *g*, *h*, and *k*, which will be seen to be more developed in Fig. 6 than in Fig. 5. Disbudding may advantageously be combined with the operation of "stopping"; any shoots not required for pruning—such as for example as *a*, *c* and *e* (Fig. 4)—being rubbed off.

INCREASING THE NUMBER OF RODS.

In the above description, in order to simplify matters, a vine pruned to only two rods has been considered. It is evident that if the number of rods be increased, as may sometimes be found desirable with very vigorous, irrigated vines, the same rules would still apply. In the "Double Guyot" pruning shown in Fig. 1, we have a long pruned vine with what Professor Bioletti would call two "units of long pruning"—one on each side. If a greater number of rods are needed, the units would be multiplied, as is so usual with the Sultana, but the rods would, of course, be laterals instead of main canes.

It must be remembered that for export, a berry of large size is required, whereas size is of little or no importance in the case of the Sultana. Large berries are most easily obtained by a judicious reduction of the number of bunches borne by the vine, hence the multiplication of rods, beyond a certain point, is most undesirable.

Pruning to two rods (as in Fig. 3) will usually permit, if the vines are not planted too far apart, a profitable yield of good sized grapes. Should the vigour of the vine warrant it, however, it will be an easy matter to provide an additional rod, or even two of them.

As regards distance apart, 10 feet x 7 feet (or perhaps 10 feet x 8 feet) will probably be found most suitable; 10 feet is a convenient distance between the rows, whilst if further than 8 feet apart in the rows the number of rods would probably require increasing, with the accompanying risk of reduced size of berry.

ORIGIN OF THE METHOD.

It may be of interest to state here that for the suggestion which led to the trial of the method in Victoria the writer is indebted to M. Alexandre Tacussel, whose magnificent collection of table grapes at Vaucluse (France) he visited in 1907.

M. Tacussel expressed his intention of causing fruit production in a vine imported from Asia Minor, which had as yet borne no fruit, by pruning to a lateral rod. He also quoted the advice given to him by M. Eckerlin, Inspector of Agriculture in the Ottoman Empire, in connexion with the pruning of the Sultanieh (same as our Sultana), that

"to obtain fine fruit it is necessary to prune to a lateral cane, the sprouting of which has been brought about by stopping the primary shoot." This advice was communicated to Mr. R. G. Cameron, of Merbein, who tried it in 1913 with most satisfactory results: so much so that he has now adopted it as a regular pruning method.

The fruitfulness of laterals receives further confirmation in a recent article by Professor Ravaz, of Montpellier (France)*, dealing with the forming of young vines. He points out how, in the case of a vigorous, strongly-grown field graft, one may form the vine the first year, selecting strong laterals for the spurs. "There is no objection," he says, "to the use of these laterals (*contre boutons* or *entre cœurs* in French). They are even said to be more fruitful than the canes which bear them. Many varieties of foreign vines scarcely produce grapes except on these." Evidently Ohanez was one of the vines Professor Ravaz had in mind.

* * * * * * * *

Such is the method of pruning which is now confidently recommended to planters of the Ohanez vine. Further experience is no doubt desirable, and will be forthcoming in due course.† The results already obtained however, notably by Mr. Cameron, are so encouraging that it would be unfair to withhold it from the vine-growing public pending further trial.

It is probable that other varieties, besides Ohanez, may with advantage be treated in similar manner—the Palomino of Jerez, for example, so long known to us under the name of Sweetwater—in fact all varieties which, like it, do not show much fruit in early spring.

* *Progrès Agricole*, 14th Feb., 1915.

† The thinner extremities of very long canes may, in the same way as laterals, prove more fruitful than the first couple of feet, which are stouter. Such a peculiarity may possibly be responsible for the *Parra* system of training so generally practised in Almeria (see *Journal of Agriculture* for September, 1908, p. 550). These much developed overhead trellises certainly lend themselves to pruning to very long rods.

SULPHUR AND PYRITES AS FERTILISERS.

New experiments on the possible fertilising action of sulphur are reported from France.

Nitrogen, as nitrate of soda, and nitrogen, as dried blood, was applied with and without admixture with sulphur.

The increased returns from the nitric nitrogen plots, *i.e.*, where the nitrate of soda was used were practically nil, but in the case of organic nitrogen, viz., blood, the returns from the sulphur plots showed an increase of 30 per cent. with wheat, and 60 per cent. in the case of beans.

These returns appear to confirm those of Boullanger and Dujardin, who found that sulphur exerts little or no action without organic nitrogen, but acts energetically in the presence of organic matter.

Sulphur pyrites acted in the same manner as sulphur, giving a 40 per cent. increase in the yield of wheat, and 50 per cent. in the yield of beans.

Extract from "Fertilisers."

7th March, 1914.

Sulphur in its elemental form was not tried in the nitrification tests conducted by Dr. Paterson and Mr. R. Rankin Scott, lately reported in this *Journal*.

THE WALNUT.

(Continued from page 439.)

C. F. Cole, Orchard Supervisor.

PLANTING.

The land having been specially prepared, and the rows marked off 4 feet apart, place the planting line in position, and open out a grip or drill about 3 to 4 inches in depth. A plough may be used for opening out the grip if planting is upon a large scale. Carefully place the nuts in the grip, and see that the root-sprout is placed pointing straight downwards. A little soil will hold the nut in position. Care must be exercised when planting that the short sprout is not injured through rough handling or downward pressure into the soil. Place the nuts not less than 9 inches apart in the planting row, and cover them with not more nor less than 3 inches of soil; sand is a valuable covering if easily procurable. If planting should be delayed, and many of the nuts have made long sprouts, it will be necessary to use a trowel or other suitable tool for deepening the grip or drill. Planting long-sprouted nuts or those commencing to send up a stem requires care. If the sprouting stem is broken in any way, it should be discarded. Injury to the root-sprout, if not too close to the nut, is not serious. When planting from the germinating bed, it is an advantage to carefully cut the root-sprout (embryo tap root) to within a few inches of the nut, thus encouraging a lateral root system. It is not wise to allow a tap-root to be unchecked and reduced back later when planting out permanently in the grove. To perform this operation, it is necessary to allow the nuts a longer period in the germinating bed to develop a long root-sprout. The advantage of checking the developing tap-root (apart from encouraging a lateral root system) is that, if the check to the tap-root is going to develop injury through cutting, it is brought about in the nursery row, and not after planting in the young grove.

The writer favours a branching root system, encouraged from the early stages of growth, instead of reducing the tap-root when planting out permanently from the nursery row.

Plate 32 depicts two types of English seedling walnuts removed from the nursery row in late spring, the nuts being planted from the germinating bed. Fig. A is developing an uninterrupted tap-root, whilst Fig. B is developing a spreading root system, which has been brought about by having the root-sprout checked by injury when planting out from the germinating bed. The practice of planting the nuts of the English seedling varieties or other species of walnuts direct in drills in the nursery row before germinating them firstly in a bed has nothing to recommend it. Nuts that do not germinate freely or show a weakly tendency should be discarded.

It will be found that many of the nuts, if planted direct in the nursery row, will not germinate through various reasons. Time and space is wasted by growing those of a weakly tendency. Besides, the risk of producing seedlings developing a crooked or undesirable tap-root is greater than when germinating the nuts before planting. Many

argue that the small percentage of crooked tap-roots can be largely decreased, when planting the nuts direct in the drills, by the position in which the nuts are placed. The nuts of the seedlings depicted in Plate 33 were planted direct with the sharp end pointing upwards, the

Plate 32.—English seedling Walnuts.

A—developing uninterrupted tap roots; B—branching root system.

·oot-sprouts emerging from the sharp end. The downward course of the leveloping tap-roots over the rounded surface of the nuts into the soil s *responsible for this particular* shape. *Compare these two examples* vith Fig. B, Plate 32, showing that the root sprouts emerged from the

nut at the blunt or stalk end. The position of the nuts lying in the bed before sprouting being dissimilar, the upward growing sprout (stem of the future tree) passed through the nut, and emerged at the sharp end. From these examples, it is obvious that the root-sprout of the walnut, when emerging, does not confine itself to any particular point.

Plate 33.—English seedling Walnuts developing crooked taproots.

although usually emerging from or about the sharp end of the nut. The common practice, when planting the nuts direct in the drills, is to place them upon the flat (see Fig A. Plate 32), or with the pointed end downwards.

PLANTING NUTS IN ORCHARD FORM.

The practice of planting nuts in orchard form in the places where the trees are to remain permanently is not largely practised in Victoria, and it is only carried out by those desirous of growing a few trees mostly for ornamental purposes.

This custom has nothing to recommend it. Apart from growing trees of non-selected types and varieties, which will eventually produce nuts of inferior quality, many of the young seedling trees will be found constitutionally weak, and not of a thrifty nature. This latter condition can be somewhat remedied by germinating the selected nuts before planting, and only selecting those nuts that sprout quickly and show a freedom of growth. Even if six or more nuts are planted in each individual place, it is not a guarantee that any one of the six nuts will produce a tree of rapid growth and of a thrifty nature. Upon the other hand, the whole six nuts may produce suitable trees, five having to be pulled out, leaving the strongest to remain permanently. Again, there is the risk that the nuts, through some reason or other, may not germinate, and may require to be re-planted the following year. The seedlings may get broken or partially injured, or, through unfavorable weather conditions, may not receive the attention they require. Eventually a grove is developed containing trees of different ages and great variations in size, and this becomes more pronounced every year. There is no necessity, and nothing is gained by planting a grove of English walnuts upon this method. Those who have already practised or uphold this method of planting a grove should ground-graft, or work over the seedling trees with selected and suitable varieties to the locality. It has already been pointed out in these articles that walnuts generally do not come true to the parent type; propagation by grafting or budding is, therefore, necessary to perpetuate a selected or choice variety.

PLANTING BLACK WALNUTS IN ORCHARD FORM.

Respecting the planting of nuts of the Black walnuts in orchard form, a diversity of opinion exists among growers. From the results of experiments carried out in California upon practical lines is embodied the following extract from *Bulletin No.* 231, Berkley, California:—

"A few years ago a very popular idea prevailed, especially in the northern part of the State, that the only proper way to plant a walnut orchard was to start black walnut seedlings directly from the nut in the spots which the trees were to occupy in the orchard, so that these seedlings could be grafted to the desired variety of the English walnut later on without ever disturbing the tap-root by digging and transplanting." After pointing out and quoting objections to this method, the author of *Bulletin No.* 231 sums up this nut planting as follows:—"Thus the whole tendency of this method in practice is to produce a most irregular, uneven orchard, which, at the same time, requires several more years for its development than is necessary under other methods. More than all this, the absolute fallacy of the notion that there is any disadvantage in cutting the tap-root or in transplanting the walnut tree has been abundantly established, so that the only object of using this method loses completely its value."

The following is part of a letter received by the writer upon the same subject:—

"*Re* Californian black walnut (*Juglans Californica*), these trees are grown alongside the roads in California, and grow to be large trees, 2 or more feet in diameter, providing they are not transplanted. I have paid considerable attention to the effect of transplanted walnuts, and have yet to see it succeed in a permanent manner. It is only nurserymen that maintain they can be transplanted; no close observer tries to do so."

The very fact that the trees in established groves in California were originally transplanted from the nursery row, such trees continuing to remain thrifty and productive, goes to prove that black walnuts root-stocks can be transplanted successfully.

Failure following the removal of the English seedlings from the nursery row in Victoria is more attributable to root injury when lifting, unsuitable soil, and climatic conditions, or neglect, than transplanting.

PLANTING BLACK WALNUT SEEDLINGS IN ORCHARD FORM.

This method of planting selected seedlings in orchard form, with the idea of grafting them later on, is practised and recommended under certain conditions in California. The advantages claimed are that seedling trees can be grafted over, about 5 feet from the ground, thus obtaining a black walnut trunk, which, with its rough bark, will be more immune to sunburn than the trunk of the English variety. In a grove which is to be grown without irrigation, the grafts upon a well-established black walnut tree will be much better nourished, and receive a better supply of moisture during the first year or two than a transplanted tree, which will be using up its energies in developing new roots. Thus the high-grafted tree will obtain a better start. The objection by some to this method is that top-grafting will probably extend over three years before all the trees bear a good top, an irregular and uneven lot of trees resulting in the grove. Another objection is that this high-grafting on trees several years old develops rapid growing shoots from the grafts, which become top heavy, easily blown over by the wind, and a source of difficulty to keep up in shape until they are able to support themselves. The tendency now is to graft low down upon the black seedlings, within 2 feet of the ground, even though the advantage of the black walnut trunk is thereby lost. After considering the different methods as practised in America, the conclusion arrived at is that if the grove is to be planted in good soil under irrigated conditions, or where there is a sufficient supply of soil moisture, the method of planting nursery-grafted trees is a decided advantage over other methods.

(*To be continued.*)

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 374.)

SELECTING SEED (*continued*).

The angle of the ear, as the ripening period approaches, should be *drooping; an erect ear is seldom a good one, and the fact that it is* erect enables it to take in moisture, which causes disease and mildew. It sometimes happens that a thick, strong shank supports an erect ear,

James Yellow Dent variety maize grown on Mr. H. James's Farm, Orbost.

and shanks of this description should be avoided in selection. The average shank should be about three-quarters of an inch in diameter, but no definite rule can be laid down in this respect, as under special circumstances, such as extremely rich soil, a larger shank will give the drooping angle.

The husk should not be too coarse and plentiful, or too scanty to cover the cob—a happy medium is the desideratum here. The tips and butts of all selected cobs should be well filled. The tip not too tapering or too blunt. In some cases, the tip is larger than the butt; this is a wrong state of affairs, and such cobs should be rejected. The butts should be well rounded, and the misshapen grains not too far back in the cob.

Colour.—Fashion appears to govern the market in regard to colour, the present demand being for a well-shaped sample with a golden-yellow colour and a tinge of red. There is no good reason given why one colour should be better than another. In Ohio, United States of America, Silver Mine, a white maize, held preference. The nutritive value in yellow and white maize is practically the same. The protein content is said to be slightly higher in the coloured maize, but as a set-off the fat is higher in the white; still, the market requirements must be the objective, and unless a white variety suits better than a coloured one the place in which it is grown, the colour the consumer prefers should be chosen. There are still further ways in which by selection the maize crop can be improved, the most noticeable of which is improvement of nutritive values in the development of the protein and oil contents

Cornplanter variety maize grown on Mr. W. Warren's Farm, Orbost.

The Illinois Experiment Station carried out experiments on these lines in the years 1896 to 1908 inclusive. Starting with the same maize the protein was gradually raised from 10.92 per cent. in 1896 to 15.03 per cent. in 1904, the amount varying in the different years, while on the reverse experiment the protein extent was lowered from 10.92 per cent. in 1896 to 7.32 per cent. in 1907, thus showing the effect of selection for protein alone. In a similar test for oil the difference was equally noticeable, as, starting with an oil content of 4.70 per cent. in 1896, the highest point reached was 7.19 per cent in 1908, and the lowest 2.39 per cent., a variation of 4.80 per cent as the result of the experiment.

Selection for protein and oil, however, is somewhat outside the ordinary growers' province, and is only quoted to show how far-reaching the methods of selection may be for general improvement.

Such a system as has been here outlined can be commenced in a small way, and easily proved. Special plots in a corner protected from wind and other disabilities should be laid out, and all results carefully recorded in a book kept for the purpose. The selected ears from the plots should make the seed for the next year's experiment, the bulk of the remaining ears being used for the main crop, and so on in future years. Maize lends itself specially to improvements in the manner suggested, the amount of seed required per acre is small—fifteen to twenty ears will sow an acre—and each ear can be easily examined for selection, labelled, and followed throughout. The use of, say, six varieties in each new district on small experimental plots to prove the most desirable, followed by a good system of selection, must in a very few years greatly improve yields and profits. The infusion of fresh blood

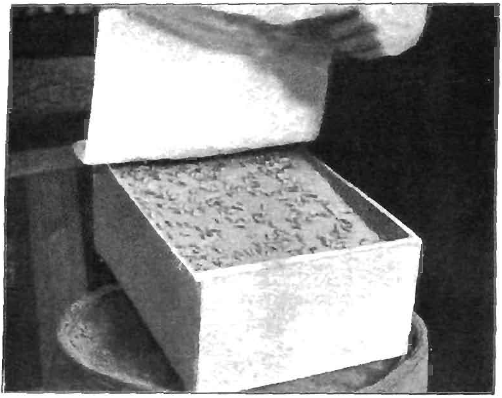


Fig. 1.—Preliminary Test.

of the same variety is advisable from time to time, as constant selection from the same plants appears after a certain period in some cases to affect the yield detrimentally.

Preparing and Testing the Seed.

Every cob used for seed should have the grain on the tips and butts rubbed off until all badly-shaped seed has been eliminated. The cob should be well examined to see that no rot, disease, or mildew has made its appearance. Maize that has dried too slowly, or has been heavily frosted, is liable to kill the germ in the kernel, and much loss may ensue on this account. Quick drying is essential for seed and early-picked ears, for if left in the heap for a few hours mould is liable to occur and cause trouble. A thick wedge-shaped kernel with the

germ well developed at the tip is what is required, badly-shaped grains, shallow and pointed with poor germs lead to loss of vitality and ultimately poor crops. Properly speaking, all seed ears should be

Fig. 2.—Ear germination test (Enough corn is seen on the shelves to plant 40 acres).

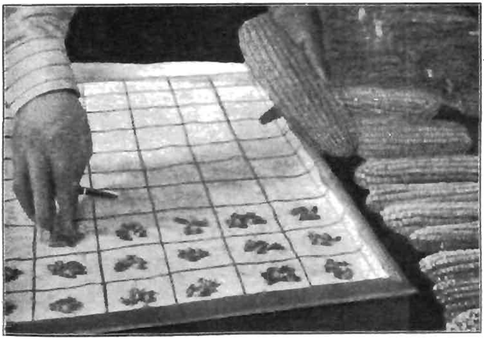


Fig. 3.—Placing the grains in the Germination Box.

tested, though little is done in this direction as a rule. The following system, given by E. G. Montgomery and C. W. Pugsley, Bulletin No. 32, Lincoln-Nebraska Experiment Station, is of value as a guide:—

"Testing every seed ear will cost from 2½d. to 5d. per acre, and may mean 5 to 10 bushels increased yield. First make a preliminary test of your seed (Fig. 1). Select 100 ears at random. Take three grains from each ear, each grain from a different part, place 300 grains in a ger-

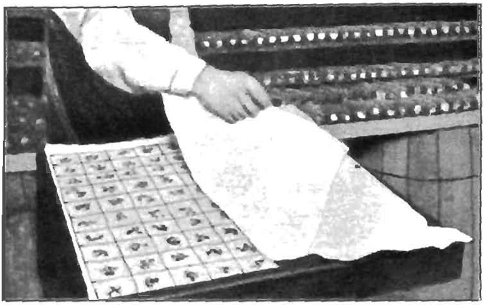


Fig. 4.—Ready for the Test.

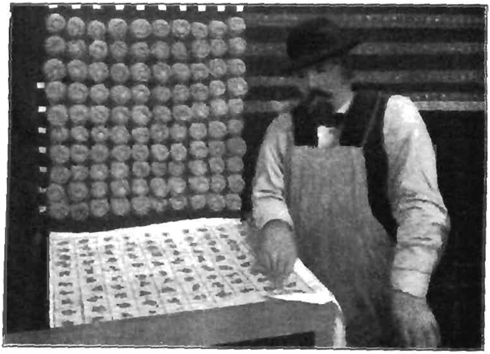


Fig. 5.—A handy rack.

mination box (any shallow box will do), put sawdust, sand, or soil on the bottom, and cover with a clean cloth or blotting paper. Place the grains on the paper, and cover with another cloth or blotting paper, and put more sand, soil or sawdust on top. Moisten well, and

keep in a warm place. Sprouting will take place in four to six days. If 95 per cent. germinate in the preliminary test, the seed is safe to sow. If less than 85 per cent germinate, it will pay to test every ear."

EAR TESTING.

Lay out all your seed ears side by side on a floor, shelves, or boards, at least twelve for each acre, keep them in such order that you can easily locate each ear after testing. This is easily done by marking *the ears which occupy the first space in each row of the tester.* It may also be done by numbering each ear to correspond with the number of the

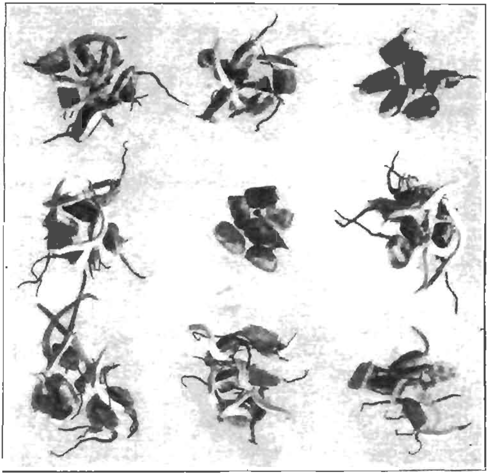


Fig. 6.—An ear germination test after 3 days.

squares in the tester. Prepare the germination box (Fig. 2) by placing 2 to 3 inches of sawdust, sand, or soil in the bottom, cover with white cloth marked in 2-inch squares. Remove six kernels from each ear; two from near the butt, two from the middle, and two from the tip, turn the ear partly round each time. Place the six grains from each ear *in the germination box in the same order as the ears are laid out.* Remove the kernels with a knife blade, and be careful not to injure the germs. (Fig. 3.) Cover the kernels with a cloth, and over this place sawdust, sand, or soil, keep well-moistened in a warm room, and in four to six days germination should be complete. Discard all ears that have not shown good, strong germination. A handy rack for drying seed corn

and keeping track of the ears in testing may be made by using 2 in. x 4 in. wood, and heavy smooth wire. (Fig. 5.) The ears in the rack correspond with the squares in the germinator, so that it is not necessary to number either ears or squares. After the test it was found some of the ears were absolutely dead, in others the sprouts were weak, while others again were vigorous. (Fig. 6.) If one ear in every forty fails you will lose 1 acre in every 40. Germinators can be made at home, the only thing necessary is to keep accurate records of the ears, and the germinator in a warm place and moist."

Time to Sow.

Good growers, in order to get a long-growing season, like to get their maize crop in as early as possible—that is, as soon as all reasonable danger of a frost is past. Nothing will, however, be gained by sowing if the land is wet and cold. Maize likes a warm seed-bed, and is likely to rot under cold, wet conditions. The grower must, therefore, use his own judgment of local conditions, bearing the above facts in mind. When sowing maize for fodder purposes any time during the months of October, November, December, and up to the middle of January will be found of advantage.

Depth to Sow.

Perhaps more mistakes are made in maize culture in Victoria by sowing too deeply than from any other cause. From 1 to 3 inches is sufficient in all well-prepared land. Deep sowing does not encourage deep rooting as is surmised, but puts an extra strain on the seed. The seed contains a supply of the requisite foods to give the plant a start in life. Should this supply run out before the blade reaches the surface, the plant is liable to die. Until it reaches the air it does not turn a green colour, and unless that occurs it cannot take in from the atmosphere that 95 per cent. of its nourishment supplied in the form of carbon dioxide. Not only is this the case, but as the young shoot gets longer under the surface it gets weaker in proportion, and when encountering lumps or a crusted surface cannot in many cases force its way through. A well-worked soil will contain the moisture to within an inch or two of the surface, where also the greatest degree of warmth is likely to be found.

In stiff, close soils a couple of inches is deep enough, while in free, friable soils 3 inches should be the maximum depth. Tests made in the United States prove that the heaviest yields were obtained from shallow sowing.

The quicker the young plant comes away and hardens the less danger there will be from cutworms and other pests.

Distances to Plant.

Here again the mistake is often made of sowing too thickly, and how common it is to find as many as one stalk in every five in a plantation non-productive. Where grain is the objective, such a condition means a serious diminution of yield, and an unnecessary drain on the food supplies of the soil.

Maize must have room for various reasons. The sun and air should have access to the whole plant, to properly mature it, and prevent disease. The soil, whatever its quality, can only produce a certain

amount of grain according to food constituents and moisture available. Considerable diversity of opinion obtains amongst growers on the question of distances, and probably always will do so, as the distances that suit one soil will not suit another.

Experience and practically testing each soil is the only safe way of arriving at the special distance to plant. On rich Orbost soils, Mr. S. J. Lynn, one of the established growers, plants 3 feet each way, dropping three seeds at each hill. Others prefer 3 ft. 6 in. between the rows, and three seeds in the row. Others again plant 4 feet apart, and drop one seed every 18 inches in the row. Rich soils containing plenty of moisture grow large stalks, and leaves, which shade the crop unduly if sown too closely, but have a better carrying capacity, consequently the probability is that such soils would yield better if the rows were 4 feet apart, with the plants three in each hill at distances in the rows of 2 to 3 feet.

Wider rows entail less cultivation as the crop grows, as a wider cultivator can be used, and more ground got over in a given time than where the rows are closer. The question of planting north and south to enable the sun to reach each side of the maize during the day with greater effect does not appear to have occurred to the Victorian grower as important, yet the effect should be good generally, and particularly as a preventive of disease, and in the cooler districts to get as much sun as possible. On poorer soils, sowing thinner on the hills gives better results with the rows 3 ft. 6 in. to 4 feet apart, according to circumstances. One grower at Bruthen stated that for years he had planted too thickly, and on reducing the seed to one per hill his yield increased from 70 to 90 bushels. It must be remembered, too, that one large ear is often better than two small ones, entailing less labour in picking and husking, while it often happens that one stalk will bear two good ears if allowed space, where only one would be the result on each stalk if planted closer, and in the latter case more stalks in proportion to grain is the result. Wherever possible it is wise to plant in check rows, so that inter-cultivation can be done in both directions, and the rows should be kept as straight as possible to facilitate this work.

When sown for fodder purposes, maize may be planted slightly thicker, but the habit of sowing broadcast is a great mistake and much too common a one. Sown broadcast and thickly the sun cannot penetrate to the bottom, and the lower leaves dry off; the stem becomes woody and indigestible; the total yield is less, and the nutritive value less also. Apart from these defects, the risk of disease is greater, and the inter-cultivation required is not possible.

(To be continued.)

SILAGE.

It is, in a season like the past, when grass and crops alike have failed in many places, that the great value of silage—that permanent insurance policy against drought—is brought home to us. By enabling the surplus of a favorable season to be held over in the best condition for a subsequent unfavorable period, silage equalizes the seasons and makes the farmer practically independent of adverse weather conditions.—W. DIBBLE.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA (*continued*).

(Continued from page 397.)

The Blackbutt (*Eucalyptus pilularis*).

Fig. 27

A tree attaining under favorable conditions a height of 300 feet, but as a rule of much less height. Its home in this State is the wooded country of Eastern and Southern Gippsland.

The timber is excellent for general purposes, used largely for building, furnishing material for flooring boards and superior shingles; also utilised for telegraph poles and railway sleepers.

The rough bark which covers the lower part of the trunk, but sometimes continues to the branches, is blackish grey outside, somewhat fibrous and brownish inside. The bark of the branches and sometimes of the upper portion of the stem is smooth and grey, or whitish in colour.

The leaves, which are scattered on the distinctly angular branchlets, are narrow, or sickle lance shaped, rather more shining on the upper than on the lower side; the veins are numerous, but very faint.

The clusters of flowers occur mostly singly from the shoulders of leaves on a strongly compressed stalk, bearing from four to sixteen flowers. The stalklets of buds are rather thick and angular, the lids of the buds conical, distinctly pointed; the fruit is half-egg or almost cup-shaped, three or four, but rarely five celled.

The Blackbutt is one of a number of eucalypts of which, from an apicultural point of view, practically nothing authentic is known. The regrettable dearth of information as to nectar production, frequency and time of flowering and length of time in bud which still exists in regard to several eucalypts growing in the moister parts of the State, is in the first instance due to the absence of interested observers, specialist bee-keepers having so far not invaded this class of country, and secondly to the difficulty of ascertaining the sources of nectar and pollen gathered by the bees in localities where the timber is tall, largely intermingled, and several varieties flower at the same time.

The Black Sallee (*Eucalyptus stellulata*).

Fig. 28.

A tree attaining a height of 50 to 100 feet, but the diameter rarely exceeding 2 to 3 feet; at high elevations it is of a scrubby growth, and is known as Black Sallee, this word being a corruption of sallow or willow. It is also called "Black Gum" owing to the rough hard dark bark on the butt, and "Green Gum" on account of the greenish or bronze coloured bark on the upper portion of the stem.

The timber is pale coloured, rarely free from gum veins, and of little value except for fuel. This is a gum, or smooth-barked

eucalypt; it has, however, more or less rough bark towards the butt, which in old trees is hard, rough and black; the upper part of the trunk is, as already mentioned, greenish, bluish, or white.

The leaves are scattered, on rather short stalks, oval lance to narrow lance shaped, shining, and of equal colour on both sides, the veins

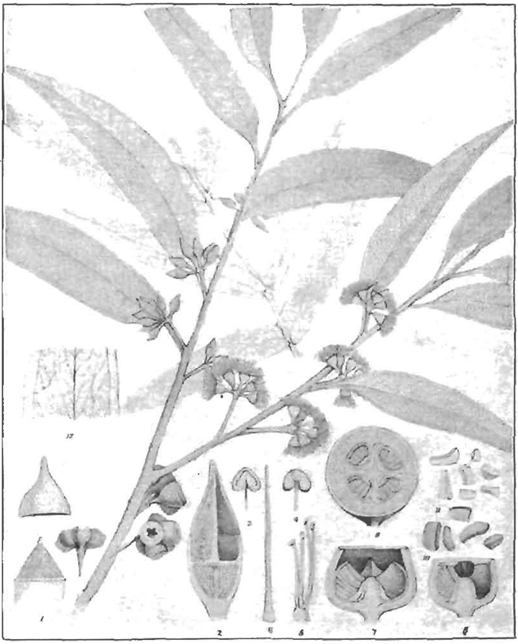


Fig. 27.—The Blackbutt (*Eucalyptus pilularis*, Smith).

almost lengthways of the leaf. The flowers are very small, almost stalkless, very numerous, six to fifteen arranged star-like in the cluster (hence the botanical name *E. stellulata*). The buds rather long and conical; the fruits are very small, half-round or cup-shaped, and mostly three celled.

In Victoria the Black Sallee is found on the Mitta Mitta, Ovens, and the Dargo High Plains. There is a narrow-leaved variety growing at higher elevations, which is of a shrubby habit.

No information is yet available as to the value of this tree to bee-culture.

Fig. 28.—Black Sallee (*Eucalyptus stellulata*, Sieb).

WHITE SALLEE (*Eucalyptus pauciflora*).

Synonym E. coriacea.

Fig. 29.

A medium-sized tree, but sometimes attaining a height of 100 fe it is known by several other vernacular names such as White Gı Willow Gum, White Sallee, distinguishing it from Black Salee (*E. ste*

lata), Tumble Down Gum by reason of its aspect, Glassy Gum on account of the glassy appearance of the upper bark; while in Tasmania, on account of its scrambling nature, it is called Weeping Gum.

In Victoria it is found in the southern districts on the lowest hills and the highest mountains. The timber is pale-coloured, full of gum

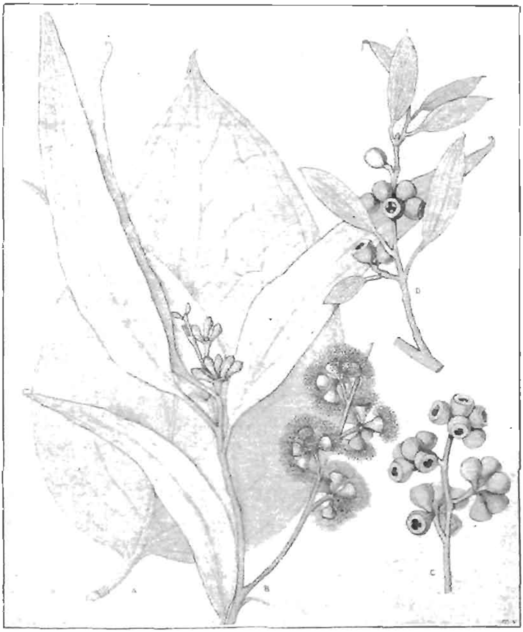


Fig. 29.—**White Sallee** (*Eucalyptus pauciflora, syn. E. coriacea,* A. Cunn).

veins, and warps a good deal; the limbs bend and twist without breaking; its chief local uses are for fuel and fencing posts, as it is very durable. The bark is distinctly of the White Gum type, the trunks of the trees being mostly quite clean down to the ground.

The leaves are scattered on the branchlets, leathery, yet often succulent, long lance, but sometimes somewhat sickle shaped, or merging

into the oval form. They are of equal colour and shining on both sides, the veins very oblique, almost parallel to the mid-rib. The flower clusters, which occur mostly singly at the shoulders of leaves, but sometimes form a spray, carry from few to many flowers; the buds are round-ended, more or less pointed; the fruits are half-round to cup-shaped, three, more rarely four or five celled.

This is a very profusely flowering eucalypt, yielding honey of the White Gum type, clear, transparent, of a golden colour, but not of high density. As in other species it varies somewhat in colour and character, according to soil, climate and elevation. Pollen is gathered by the bees from the flowers, as from all other trees known as White Gums with the exception of *E. leucoxylon* (The Yellow Gum), which passes as a White Gum in some localities. As with most of the White Gums, the time of flowering is very variable, and the length of time the White Sallee is in bud has not so far been ascertained.

The Snow Gum (*Eucalyptus pauciflora variety alpina*).

This is a variety of the White Sallee, frequently high mountain localities. It has short and nearly straight leaves, and is but a tall shrub or small tree, with more or less whitish bloom on the foliage.

The trees of this species at the highest elevations are remarkable for their bare stems, surmounted with a dome or flattish top of leaves. The bare stems are doubtless the consequence of winds, the leaves being concentrated on top as a thin layer, and offering a minimum resistance to the wind. A fruiting twig of this variety is shown in the right top corner of the illustration (Fig. 29).

(*To be continued.*)

QUICKSILVER IN CHEESE.

An accident, which is probably not infrequent in cheese factories, lately brought a cheese manufacturer and his assistants before the local court at Memmingen.

The defendant was engaged in preparing the daily batch of cheese, and while so engaged the thermometer which he used to test the temperature of the milk in the cheese kettle, happened to break, with the result that the mercury in the bulb of thermometer became mixed with the coagulated milk and thus was found in the cheese.

The cheese-maker, however, proceeded with his operations, and although he could have called up his employer by telephone, he omitted to do so.

In due course the cheese went upon the market and a purchaser discovered the globules of quicksilver.

The court sentenced the cheesemaker to imprisonment for two weeks and in addition ordered him to pay the costs of the trial.—[Extract from *Pure Products*, March, 1915.]

VERNACULAR NAMES OF VICTORIAN PLANTS.

Continued from page 91, Vol. XII. (10th February, 1914.)

Communicated by Alfred J. Ewart, D.Sc., Ph.D., Chairman, and C. S. Sutton, M.B., Ch.B., Secretary of the Plant Names Committee of the Field Naturalists' Club of Victoria.

In the *Journal of Agriculture* for June and August, 1911, a list of the vernacular names for approximately one-third of the Victorian flora was given, the second-third was published in the *Journal of Agriculture* for July and September, 1912, and February, 1914.

The present list will complete the Vernacular Names of Victorian Plants. This portion of the list includes the majority of our forest trees, and it is hoped that the economic data attached to the various species of our Eucalypts will draw attention to the importance of certain much neglected trees. The economic data given for these trees have been revised by Mr. H. R. Mackay, Conservator of Forests. In addition, a very large number of the Myrtaceae are plants of great decorative value.

The completion of the list has involved nearly sixty meetings of the committee.

The working committee by whom the final decisions have been made are:—

Chairman: A. J. Ewart, D.Sc., Ph.D., &c.
Honorary Secretary: C. S. Sutton, M.B., Ch.B.
Committee: F. G. A. Barnard, J. A. Leach, D.Sc., F. Pitcher, P. R. H. St. John, and J. R. Tovey.

Useful assistance has been received from Messrs. G. H. Adcock, A. C. Dreverman, J. P. Eckert, R. Kelly, J. P. McLennan, E. E. Pescott, L. Rodway, and Rev. R. Thom, and minor suggestions have been received from a large number of correspondents.

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Callitrichaceæ.		
Callitriche—		
verna, L.	Variable Water-Starwort ..	Water weeds of no known economic value.
Muelleri, Sonder. ..	Round Water-Starwort ..	
Myrtaceæ.		[All the Victorian Myrtles are aromatic, and almost without exception of value for their timber, oils or as garden plants.]
Darwinia—		
taxifolia, Cunn.	Yew Scent-Myrtle ..	Worthy of garden culture.
micropetala, Benth. ..	Small Scent-Myrtle ..	
Homoranthus—		
virgatus, A. Cunn. ..	Twiggy Scent-Myrtle ..	
Calytrix—		
tetragona, Labill. ..	Common Fringe-Myrtle ..	Handsome shrubs of great decorative value.
Sullivani, F.v.M. ..	Grampian Fringe-Myrtle ..	
Lhotzkya—		
genetylloides	Snow Myrtle ..	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Myrtaceæ—*continued.*		
Thryptomene—		
*Mitchelliana, F.v.M. ..	Bushy Heath-Myrtle ..	One of the most beautiful native shrubs. Grows well in gardens.
ericaea, F.v.M.	Dwarf Heath-Myrtle ..	Worthy of garden cultivation.
Micromyrtus—		
microphylla, Benth. ..	Fringed Heath-Myrtle ..	
Baeckea—		
diffusa, Sieber	Spreading Heath-Myrtle ..	All are attractive shrubs worthy of garden cultivation.
crassifolia, Lindl. ..	Desert Heath-Myrtle ..	
ericaea, F.v.M.	Small Heath-Myrtle ..	
Gunniana, Shauer ..	Mountain Heath-Myrtle ..	
linifolia, Rudge	Flax Heath-Myrtle ..	
camphorata, R.Br. ..	Camphor Heath-Myrtle ..	
virgata, Andrews ..	Twiggy Heath-Myrtle ..	
crenatifolia, F.v.M. ..	Fern Heath-Myrtle ..	
Behrii, F.v.M.	Broom Heath-Myrtle ..	
Leptospermum—		
*laevigatum, F.v.M. ..	Coast Tea Tree	Very useful for arresting drift sand, on sea shores or sand deserts, also a splendid hedge plant.
flavescens, Smith ..	Tantoon	Wood hard and close-grained; diameter, 5 to 8 inches; height, 15 to 20 feet.
scoparium, R. and G. Forster	Manuka	The leaves have been used as a substitute for tea, but the taste of the infusion is too aromatic to be palatable.
lanigerum, Smith ..	Woolly Tea-Tree ..	The wood hard and heavy. Used by the Aborigines for making spear handles. The flowers last well when cut and useful for sprays.
attenuatum, Smith ..	Slender Tea-Tree ..	Could be used as a hedge plant in moist situations.
myrtifolium, Sieber ..	Myrtle Tea-Tree ..	Wood close-grained, tough, dark in colour; height, 8 to 10 feet.
myrsinoides, Schlech. ..	Myrrh Tea-Tree ..	An ornamental shrub, worthy of garden culture.
Kunzea—		
Muelleri, Benth. ..	Yellow Kunzea	Worthy of cultivation. The wood of K. peduncularis was used by the Victorian aborigines for waddies, boomerangs, &c.
parvifolia, Schauer ..	Crimson Kunzea ..	
peduncularis, F.v.M. ..	Burgan	
corifolia, Reich. ..	White Kunzea	
pomifera, F.v.M. ..	Muntries	The berries of this shrub are useful for making jam or preserves.
Callistemon—		
*lanceolatus, D.C. ..	Crimson Bottlebrush ..	Wood hard and heavy; it is useful for wheelwrights' work, &c.
*coccineus, F.v.M. ..	Scarlet Bottlebrush ..	Worthy of garden cultivation.
salignus, D.C.	Willow Bottlebrush ..	Wood very hard and close-grained; durable underground; also useful for engraving.
paludosus, F.v.M. ..	Swamp Bottlebrush ..	All are useful for garden culture.
Sieberi, D.C.	Mountain Bottlebrush ..	
pithyoides, Miquel ..	Pine Bottlebrush ..	
linearis, D.C.	Narrow-leaved Bottlebrush	
brachyandrus, Lindl. ..	Prickly Bottlebrush ..	
Melaleuca—		
*hypericifolia, Smith ..	Red Honey-Myrtle ..	Worthy of garden cultivation.
acuminata, F.v.M. ..	Snowy Honey-Myrtle ..	
gibbosa, Labill	Slender Honey-Myrtle ..	
decussata, R.Br. ..	Cross Honey-Myrtle ..	Wood hard and tough. Leaves, &c., yield an essential oil.
Wilsonii, R.Br. ..	Purple Honey-Myrtle ..	Yields a pale yellow-coloured oil. Flowers brightly coloured.
squarrosa, Donn. ..	Scented Paper-Bark ..	Wood hard, dense, and durable under water. Its oil is green-coloured.
parviflora, Lindl. ..	Moonah	Useful as a sand stay.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

CHORIPETALEÆ PERIGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MYRTACEÆ—*continued.*		
Melaleuca—continued.		
armillaris, Smith ..	Bracelet Honey-Myrtle ..	Wood hard and durable for inside, underground, or water work.
uncinata, R.Br... ..	Broom Honey-Myrtle ..	Yields a green oil. Wood very hard, close, durable.
squamea, Labill.. ..	Mealy Honey-Myrtle ..	No special value.
ericifolia, Smith ..	Swamp Paper-Bark ..	Yields a pale yellow oil. This wood is extensively used for bush fences, rustic work, clothes props, &c.
pustulata, Hook. f. ..	Blistered Honey-Myrtle ..	Of no known economic value.
neglecta, Ewart and Wood	Mallee Honey-Myrtle ..	Of no known economic value.
Angophora—		
intermedia, D.C. ..	Gum Myrtle	An ornamental shade tree, whose timber is useful for naves and spokes of wheels, but is often subject to gum veins.
EUCALYPTUS.		
1. *Renantherae*—		
stellulata, Sieber ..	Black Sallee	Stands frost well. Fairly good fuel.
*pauciflora, Sieber ..	White Sallee	Wood soft and short-grained. Used for fencing purposes. Good fuel.
var. alpina	Snow Gum	Wood soft and short-grained. Used for fencing purposes. Good fuel.
*regnans, F.v.M.	Mountain Ash Gum ..	A long-grained, fairly light timber. Often has a handsome figure. Largely used in building construction, cask-staves, split palings, and mine laths. Useful for carriage-building, panelling, and furniture.
*amygdalina, Labill. ..	Narrow - leaved Peppermint	Useful for palings, shingles, and rails, also for general building purposes. Yields a useful oil.
radiata, Sieb.	River White Gum ..	Yields a useful oil, strongly levorotatory, and containing only a trace of Eucalyptol.
dives, Schauer.	Blue Peppermint ..	Chief source of "Phellandrene." Useful in flotation of metals.
*obliqua, L'Herit ..	Messmate	Wood useful for general sawn timber in building construction. A useful substitute for oak in Australian made furniture.
vitrea, Baker	White top Gum ..	Timber hard and close-grained, but at present of little economic value.
*santalifolia, F.v.M. ..	Sandal Gum	A good oil yielder.
*macrorrhyncha, F.v.M. ..	Red Stringy-bark ..	Timber hard and durable; splits well. Used largely for framework of buildings, bridge piles and beams, fence posts, and telegraph poles.
capitellata, Smith. ..	Brown Stringy-bark ..	Useful for fence rails, shingles, and building purposes, also telegraph poles.
*Muelleriana, Howitt ..	Yellow Stringy-bark ..	A very durable timber in contact with the ground. Used for framework, railway rolling-stock, wharf and jetty timbers, building material, and for piles, telegraph poles, &c.
*eugenioides, Sieber ..	White Stringy-bark ..	Yields a good timber, generally useful for building purposes, railway sleepers, piles, and poles.
var. nana	Dwarf White Stringy-bark	Yields a good timber, generally useful for building purposes, railway sleepers, piles, and poles.
*piperita, Smith	Peppermint Gum ..	Timber useful for posts, shingles.
*pilularis, Smith ..	Blackbutt	A good timber, generally useful for railway sleepers and telegraph poles, also for building construction.
*haemastoma, Smith ..	Brown Messmate ..	Timber not very durable. Fair fuel. Used for rough buildings, fencing, &c.
Consideneana, Maiden ..	Yertchuk	Useful for fence posts, bridge-decking, rails, &c. The oil is useful.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Choripetaleæ Perigynæ—*continued.*	
Eucalyptus—continued.		
1. *Renantherae*—continued.		
*Sieberiana, F.v.M. ..	Silver-top	Light, long-grained timbers, which season well, are easily wrought, and take a good finish. They are useful for ship building, cart-shafts, general building purposes, and furniture.
delegatensis, R. T. Baker ..	Red Mountain Ash ..	
2. *Porantherae*—		
*paniculata, *Smith* ..	Grey Iron-bark ..	Useful timber, especially where great strength and durability are required. Yields excellent railway sleepers, beams or girders, piles, and telegraph poles.
fasciculosa, F.v.M. ..	Pink Gum	A good timber for framework of buildings. Makes durable fence posts. Yields fair fuel.
*sideroxylon, Woolls ..	Red Iron-bark	Excellent heavy timber, resistant to white ants and teredo. Used for railway sleepers, beams, and girders, wharf construction, piles, telegraph poles, and mine props, and for many kinds of building purposes.
*leucoxylon, F.v.M. ..	Yellow Gum	Excellent timber. Useful for general building purposes. Used for railway sleepers, telegraph poles, and piles.
*melliodora, Cunn. ..	Yellow Box	Wood hard, resistant to teredo, useful for shipwrights and coach-builders. A good honey tree. Yields durable railway sleepers, piles, poles, and foundation timbers of wooden houses.
*polyanthemos, Schauer ..	Red Box	Durable timber, good fuel, stands well in saltwater. Rivals ironbark for railway sleepers and piles.
calycogona, Turcz. (gracilis, F.v.M.)	Slender Mallee	These Mallees are too small to be useful as timber trees, but Eucalyptus oil is extracted from them. That of *E. polybractea* contains over 75 per cent. of Eucalyptol. Their roots form excellent fuel and are used for ornamental rustic work.
viridis, R. T. Barker ..	Green Mallee	
polybractea, R. T. Baker	Blue Mallee	
uncinata, Turcz. ..	Hooked Mallee	
Bauerina, Schauer ..	Fuzzy Box	
odorata, Behr.	Scented Peppermint ..	
*Bosistoana, F.v.M. ..	Gippsland Box	A durable timber. Useful for railway sleepers, piles, poles, and for wharf and jetty construction.
*bicolor, A. Cunn. (largiflorens, F.v.M.)	Black Box	The timber is hard, tough, and very durable both above and below ground. Useful for railway sleepers, foundations of buidings, poles, and fence posts.
Behriana, F.v.M. ..	Bull Mallee	Yields Eucalyptus oil. Useful for fuel.
*hemiphloia, F.v.M. ..	Grey Box	Excellent for fuel. Timber hard and durable in all situations. Largely used for railway sleepers, piles, and telegraph poles.
var. albens	White Box	
3. *Parallelantherae*—		
*alpina, Lindl.	Grampians Gum ..	Timber of no commercial value.
*globulus, Labill. ..	Blue Gum	One of the best of our hardwoods, as durable as and stronger than British Oak. Also valuable for its oil.
Maideni, F.v.M. ..	Spotted Blue Gum ..	Somewhat similar to the preceding.
*longifolia, Link. ..	Wollybutt	A very useful timber for railway sleepers, bridge decking, house framing, fence posts, and felloes.
*botryoides, Smith. ..	Mahogany Gum ..	A handsome shade tree; timber hard, tough, and durable, useful for ship-building.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	CHORIPETALEÆ PERIGYNÆ—*continued.*	
EUCALYPTUS—*continued.*		
3. *Parallelantherae*—continued.		
*goniocalyx, F.v.M.	*Grey Gum*	*Timber durable, tough; useful for wheelwrights' work.*
nitens, Maiden	Shining Gum	Timber straight in grain, useful for rough wood-work.
elaeophora, F.v.M.	Long-leaf Box	Timber has apparently no commercial value, except for fuel.
incrassata, Labill.	Giant Mallee	Useful for fuel, especially its roots.
incrassata, var. dumosa	*Small Mallee*	Yields Eucalyptus oil.
oleosa, F.v.M.	*Oil Mallee*	
*cladocalyx, F.v.M. *(corynocalyx), F.v.M.	Sugar Gum	The timber is useful for railway sleepers, piles, telegraph poles, and fences. A fast-growing tree, used extensively for *shelter and wind-breaks.*
Gunnii, Hook. f.	Cider Gum	A kind of cider has been made from the sap.
camphora, R. T. Baker	Sallow Gum	Timber is soft, pale-coloured, of poor commercial value.
paludosa, R. T. Baker	Swamp Gum	Timber hard, close-grained. Cut into rough building timber, mine props, and fuel.
Kitsoni Leuhm. and Maiden	Dwarf Gum	Roots and stumps used as fuel. Oil valuable.
neglecta, Maiden	Neglected Gum	Of no known economic value.
cinerea, F.v.M.	Mealy Stringy-bark	A fair fuel.
Smithii, R. T. Baker	Gully Gum	*Timber is close-grained, hard, and difficult* to work. Valuable as an oil yielding tree.
maculosa, R. T. Baker	White Brittle Gum	Timber of poor commercial value.
*Stuartiana, F.v.M.	Apple Gum	Timber is useful for ships' planks, and an excellent fuel. Cut also for railway sleepers and for rough building purposes.
Bridgesiana, R. T. Baker	*But But*	*Timber is fairly hard, but only useful for* indoor work. A fairly good fuel.
*viminalis, Labill.	Manna Gum	Timber very variable in quality. Used for rails, shingles, and building material; also for mine props and laths.
rubida, Deane and Maiden	Candle Bark Gum	Timber of not much use commercially.
*rostrata, Schlech	River Red Gum	Timber hard, valued for its durability in contact with the ground, and is used for railway sleepers, piles, short beams, bed-logs, mine shafting, keelsons, and paving blocks. Resists white ants and teredo.
*tereticornis, Smith	Forest *Red Gum*	*Timber indistinguishable from that of* Euc. rostrata, but generally has fewer gum-veins than latter. Very durable.
*corymbosa, Smith	Blood Wood	Timber used in fencing, and as piles or sleepers. Resistant to white ants and teredo.
maculata, Hooker	Spotted Gum	Timber used in ship building, street paving, *wheelwrights' work, framework, and* railway carriage building.
Tristania—		
laurina, R.Br.	Kanooka	Timber dark in colour, hard, tough, and close-grained. Used for tool-handles cogs of wheels, &c.
Backhousia—		
myrtifolia, Hook and Harvey	Grey Myrtle	Useful for garden culture.
Eugenia—		
*Smithii, Poiret	Lilly Pilly	A handsome tree makes a good hedge or *flowering tree in gardens The fruits* are acid and wholesome; wood close grained but apt to split in seasoning It makes good axe handles.

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
Choripetaleæ Perigynæ—*continued.*		
Rhamnaceæ.		
Pomaderris—		
lanigera, Sims ..	Woolly Pomaderris ..	Useful for garden culture.
ferruginea, Sieb.	Rusty Pomaderris ..	
elliptica, Labill.	Oval Pomaderris ..	
vacciniifolia, Reiss.	Round-leaved Pomaderris	
ledifolia, Cunn.	Eastern Pomaderris ..	
apetala, Labill. ..	Hazel Pomaderris ..	The wood is of satiny texture, and adapted for carvers' and turners' work.
cinerea, Benth. ..	Grey Pomaderris ..	Useful for garden culture.
prunifolia, Cunn.	Plum-leaved Pomaderris ..	
ligustrina, Sieber	*Privet Pomaderris* ..	
betulina, Cunn. ..	Birch Pomaderris ..	
obcordata, Fenzl.	Lobed Pomaderris ..	
racemosa, Hook.	Clustered Pomaderris ..	
subrepanda, Reiss	Wrinkled Pomaderris ..	Although the flowers are small, those with dense clusters may prove worthy of garden cultivation.
elachophylla, F.v.M.	Small-leaved Pomaderris ..	
phylicifolia, Lodd.	Narrow-leaved Pomaderris	
Trymalium—		
Daltoni, F.v.M. ..	Grampians Trymalium ..	
Cryptandra—		
propinqua, *Cunn.*	*Silky Cryptandra* ..	
amara, Smith ..	Prickly Cryptandra ..	
tomentosa, Lindl.	Downy Cryptandra ..	
leucophracta, Schlech.	White Cryptandra ..	
Scortechinii, F.v.M.	Shiny Cryptandra ..	
Spyridium—		
serpyllaceum, F.v.M.	Lobed Spyridium ..	
parvifolium, F. v.M.	Dusty Miller ..	
spathulatum, F.v.M.	Spoon-leaved Spyridium ..	
bifidum, F.v.M.	Forked Spyridium ..	
subochreatum, Reissk.	Velvet Spyridium ..	
vexilliferum, Reissk.	Wing Spyridium ..	
eriocephalum, Fenzl.	Heath Spyridium ..	
Discaria—		
australis, Hook ..	Austral Anchor Plant ..	A garden curiosity.
Vitaceæ.		
Cissus—		
Baudiniana, Brouss.	Kangaroo Vine ..	Of no known economic value.
hypoglauca, A. Gray	Water Vine ..	Yields black edible fruits of the size of small cherries.
Araliaceæ.		
Astrotricha—		
ledifolia, D.C. ..	Starhair ..	Of no known economic value.
Panax—		
Murrayi, F.v.M.	Large-leaved Panax ..	Wood of a light colour, soft, useful for lining boards.
sambucifolius, Sieber	Elderberry Panax ..	The wood is sound and very tough. Used for axe handles.
dendroides, F.v.M.	Tall Panax ..	Somewhat similar to the preceding.
Umbelliferæ.		
Hydrocotyle—		
vulgaris, L. ..	Common Pennywort ..	Of no known economic value.
hirta, R.Br. ..	Hairy Pennywort ..	
laxiflora, D.C. ..	Stinking Pennywort ..	
tripartita, R.Br.	Slender Pennywort ..	
pterocarpa, F.v.M.	Wingfruited Pennywort ..	
geranifolia, F.v.M.	Forest Pennywort ..	
medicaginoides, Turcz.	Trefoil Pennywort ..	
callicarpa, Bunge	Small Pennywort ..	
capillaris, F.v.M.	Thread Pennywort ..	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

CHORIPETALEÆ PERIGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
UMBELLIFERÆ—*continued.*		
Hydrocotyle—continued.		
asiatica, L.	Indian Pennywort	In India, this plant is used both as an external and as a local remedy for certain skin diseases.
Didiscus—		
pusillus, F.v.M.	Small Didiscus	
cyanopetalus, F.v.M.	Blue Didiscus	
pilosus, Benth.	Wild Parsnip	
glaucifolius, F.v.M.	Grey Didiscus	
humilis, Hook. f.	Alpine Didiscus	
Trachymene—		
heterophylla, F.v.M.	Slender Trachymene	All are more or less troublesome weeds either in pastures or in cultivated ground.
ericoides, Sieber	Heath Trachymene	
Billardieri, F.v.M.	Shrubby Trachymene	
Xanthosia—		
tridentata, D.C.	Rock Xanthosia	
pilosa, Rudge	Woolly Xanthosia	
pusilla, Bunge	Hairy Xanthosia	
dissecta, Hook. f.	Cut-leaved Xanthosia	
Atkinsoniana, F.v.M.	Tall Xanthosia	
Azorella—		
Muelleri, Benth.	Pennywort Azorella	
cuneifolia, F.v.M.	Wedge-leaved Azorella	
dichopetala, Benth.	Hairy Azorella	Plants of no economic value.
Huanaca—		
hydrocotylea, Benth.	Snow Pennywort	
Actinotus—		
*Helianthi, Labill.	Common Flannelflower	Well worth garden cultivation.
Gibbonsii, F.v.M.	Small Flannelflower	
Eryngium—		
rostratum, Cav.	Blue Eryngo	Useless and troublesome weeds.
vesiculosum, Labill.	Trailing Eryngo	
Apium—		
prostratum, Labill.	Sea Celery	Might be utilized as a culinary vegetable.
leptophyllum, F.v.M.	Slender Celery	Has a slight pasture value.
Sium—		
latifolium, L.	Water Parsnip	
Seseli—		
Harveyanum, F.v.M.	Alpine Sesely	
algens, F.v.M.	Snow Sesely	Of no known economic value.
Crantzia—		
lineata, Nuttall	Creeping Crantzia	
Aciphylla—		
simplicifolia, F.v.M.	Mountain Aciphylla	
glacialis, F.v.M.	Snow Aciphylla	
Daucus—		
brachiatus, Sieber	Austral Carrot	When abundant, has a slight pasture value especially for sheep. Gives an unpleasant flavour to milk and butter of cows.
Oreomyrrhis—		
andicola, Endl.	Andian Carroway	Of no known economic value.
pulvinifica, F.v.M.	Cushion Carroway	

* Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

(To be continued.)

THE MANAGER—HIS INFLUENCE ON THE OUTPUT.*

By J. S. McFadzean, Senior Dairy Supervisor.

To first thought, it might appear that the duties of manager in a cheese or butter factory are mainly confined to the manufacture of a good commercial product. Certainly, the ability to turn out uniformly good saleable produce from the varying quality of milk or cream supplied by the average farmer is a most necessary item in his numerous qualifications; still, most managers will admit that this is by no means the most difficult part of the work. Scientific research has, to a considerable extent, reduced the main variations in the manufacture of dairy produce to questions of acidity and temperature, the problems of which are possible of being mastered by a reasonable amount of study and practice; but the many qualifications other than this which combine to make the successful manager are inherent in the individual—natural gifts, possibly latent, but capable of much development. The position of manager affords great opportunity for individual initiative, and many have succeeded in building up trade where others have failed. Weather conditions, of course, largely control the cream supply at every factory: but, apart from this, increase of business will come to some managers without any apparent effort. Others not so fortunate may set this down to luck, but there is more than mere chance behind it; and a little observation will disclose the fact that the successful manager has a knack of building up trade that is peculiarly his own, and it is the outcome of tactful, resourceful, and forceful method.

Looking closer into this, it may be seen that, apart from a scientific and practical knowledge of his work, to be successful, a manager must possess good business acumen, determination and tenacity of purpose, tact and initiative, and it will also be most advantageous to him to have a leaning towards scientific agriculture. Foremost amongst these may safely be set that most valuable qualification—business ability; meaning in this instance not so much a knowledge of finance, or keenness in making a bargain, but particularly calling for honest trading, and a determination to see that both the factory and its suppliers get their fair due. For instance, should it happen that a somewhat graspin individual—and there are such—be both a cream supplier and one of the factory directors, and thus in a position of some authority over the manager, it may require no little tact on the part of the latter to keep the scales of justice on an even balance. To in any way favour one supplier is to be somewhat unfair to all others, and it is better to risk offending by fair than by unfair dealing; for while the latter is in danger of disclosing itself at any time, the straight course makes for universal confidence. This confidence of his suppliers is the best safeguard the manager can have against interference with his supply by trade competitors, being in itself a potent factor in building up trade, and it is absolutely essential to success.

To be able to distinguish between those suppliers who bring in low-grade cream inadvertently, and such as are careless in their methods,

* An address delivered before Factory Managers' Conference at Melbourne, May, 1915.

also requires some little study. A few well-directed questions may in some instances suffice to discover the truth, but other cases may continue to puzzle the manager for some time, even, perhaps, until an inspection is made of the dairy farm. In dealing with such, assistance can frequently be had from the district dairy supervisor by acquainting him with the trouble, and asking for a quiet investigation, which will invariably be attended to. But where the Government inspection of dairy farms has not yet become operative, the manager may have to personally make the inquiry. It is here a knowledge of the producer's side of the business will be necessary; for water supply, drainage, ventilation, fodder, method of feeding, and health of cattle, as well as the handling of the milk and cream, may all call for investigation, to do which the manager will require to be what the Americans would call "some" dairyman.

When occasion demands that advice or other instruction regarding his cream supply has to be imparted to a client, the astute manager will always give it personally and privately, allowing each to keep their own counsel on the matter if they so desire, and they will respect him for it. Most suppliers will take heed of what is said to them privately, whereas an attempt to correct their shortcomings in the presence of others will invariably give offence, and enmity may be thus incurred, and custom lost. Straight talking makes good friends if only discretion is exercised in its use.

Other classes of customers requiring some tact to handle are those who imagine they are not getting a fair cream test, and who are continually changing about from one factory to another in search of better results. Some of these are careful people, who can be brought to have confidence in their local factory by closer acquaintance with the manager and his working methods; but others are so mistrusting that it is hard to deal with them. Usually, the fault lies with themselves, their style of trading being characteristic of their dairying methods; and the dairy farmer who lacks system in the handling and the delivery of his cream will certainly have variation in its quality and test. With these, it is well to bear in mind that there is always the possibility of reforming even the most erratic of individuals, and the manager who will go out of his way to smooth over the difference by finding the cause of dissatisfaction, will more than likely ultimately win the supplier's confidence, and his improved custom permanently. The satisfied customer is the best advertisement the factory can have, and the watchful manager will not allow a supplier to go elsewhere if a special effort will retain him. He can look him up for a quiet talk at a sale, or on market days, but for preference call on him at his farm. In most cases the farmer is more approachable at home, and the interest shown in his supply will be appreciated; so that, if the difference between them is not there and then adjusted, the call will at least leave the way clear for the farmer to again become a supplier without having practically to acknowledge he had made a mistake in leaving the factory, as he will probably quickly find out. Broadly speaking, the local factory should be the best for every farmer in the district, and the manager should see that he gets all of the trade. Providing he is strictly impartial in his business methods, the farmers will give him full credit for hustling for trade, and they will also give him much assistance when

they see he is working for it. In short, by the exercise of tact, hustle, and perseverance, combined with honest trading, the suppliers may be brought to work with the manager to increase the business of the factory and all will benefit thereby.

So far, however, these are all matters within the direct province of every manager in the country factories, but there are many who can and do go much beyond this in building up trade. An abundance of fodder is necessary to produce a good cream supply; and in many instances the manager will be found to have increased his output considerably by interesting himself in the farm work of his clients. Many farmers will benefit by being reminded each month in respect to fodder sowings. Their main crops of hay, potatoes, or maize, will be regularly put in; but the necessity for having an additional acre or so for early green stuff, mangels, or a late crop of maize, may be easily overlooked; and it is these early and late sowings that most frequently carry the milking herd safely through some critical time in the autumn or winter months. Even where the manager feels that he is not qualified to give advice on farming matters, he may meet the situation by keeping in a handy position one of the farming calendars distributed by the city seed firms, and which give directions for this work, and by reference thereto when occasion offers he can raise a discussion in regard to what should be sown. There are very few farms in the State on which an even milk supply can be maintained without growing fodder to support the grazing, and every one interested in the production of dairy produce should miss no opportunity to push the advantages of cultivation. There are still many farms on which even the household vegetables are not grown, much less fodder for the cattle; but, by constantly hearing others talking about what crops they have coming on, even these owners may be brought to make a move on similar lines. Some will, however, require it to be repeatedly demonstrated to them that the fodder growers have cream to sell, when they themselves are getting no returns, before they will improve their methods. Even in a district where cultivation is fairly general an occasional discussion amongst the farmers will do much good; for it not only brings out the experiences of each, but it tends to stimulate a friendly spirit of emulation amongst them, spurring each to his best work.

Every district has variations of climate, soil, or situation, which preclude definite rules being laid down for fodder cultivation; but the following short calendar shows those crops capable of being successfully grown in the dairying districts of this State under normal weather conditions, and within the months specified:—

February to April ..	.. Rape, barley, rye, sowing with either barley or rye, a proportion of peas or tares.
April to July	.. Oats with tares.
August and September	.. Mangels, carrots, swede turnips.
October and November	.. Pumpkins, millet and early varieties of maize, such as Pride of the North and Early Leaming.
November and December	.. Hickory King, Eclipse or Yellow Dent maize.
January and February	.. Early varieties of maize again.
January to October	.. Cabbage.

With maize, mangels, pumpkins, rye, or barley, should the soil be at all dry, it is well to soak the seed for at least a full day before sowing, to insure even and quick germination.

To keep the herd well supplied, a sowing of some fodder crop should be made at least every second month throughout the year, allowing that the area sown each time will provide fully 10 cwt. of green feed for each cow, and not less than 15 cwt. per head for the autumn and winter months.

It is impossible to over-emphasize the necessity for dairy farmers having an abundance of fodder on hand at all times; and, should favorable seasons provide what might appear to be a superabundance, let the oft repeated and thoroughly sound advice given previously at this annual conference by others be then put to practical effect by making all such surplus into silage, and an officer of the Agricultural Department will oversee the operation if required. The farmer with a full silo has no immedate fears of a drop in his milk yield; even a three months' dry spell will trouble him little, though his less provident neighbours may see their returns dwindle to vanishing point through the want of succulent fodder. From month to month, without fail, talk cultivation and care of the milking stock, and the factory returns will continue to increase.

Reference need hardly be made here of the advantages arising from the establishment of farmers' clubs or associations for co-operation in purchasing household or farm necessaries and the marketing of produce. It is in connexion with our factories that this has been most generally carried out in this State already; but every movement of this sort that brings farmers together is of benefit to the factory, for interchange of ideas and experiences makes for all round improvement.

It will be recognised that all that has been said here on this subject is with the object of making the factory a centre of information to its suppliers, for only too often will it be found of no more interest to them than the cream-stand on the roadside, and somewhat behind the railway siding. This should not be. The factory should be something more to the farmer than a dumping platform for his cream. He should feel that it is working in sympathy with him, and for him; and he will reciprocate. To those who have not already opened out on these lines, it may appear that the suggestion means increasing the work, but those who take it up find recreation in it. It puts life into a man to feel that he is building up a business, and especially when he is helping others thereby; and all country businesses are built up most surely by those who understand and work in sympathy with their clients. Certainly the opportunity to occasionally get out amongst the farmers is not always afforded the manager, and here there may be an oversight on the part of the owner or directors; but the go-ahead manager will usually overcome this, for, when the factory returns begin to show that he is getting hold of the trade, there is not likely to be much opposition to any project to increase it. At the outset of this paper, *resourceful* and *forceful* were two of the terms used in describing a successful manager's qualifications; and to such a one there will always come the opportunity to get about among his suppliers when occasion specially calls for it.

In conclusion, the very nature of our factory managers' vocation demands that they should be progressive. To master their business they must have been studiously inclined, for science plays a large part in their work; and that they are desirous of improving themselves is

shown, if in nothing else, by their regular attendance at this annual conference. Initiative, no doubt, therefore, most of them possess, for it is largely the outcome of concentrated effort. It may thus be safely said that, almost without exception, every manager may have a very decided influence on the output of his factory; and it only remains for each to exercise his faculties in these several directions, to practically demonstrate it.

MILLING ALFALFA (LUCERNE) IN CALIFORNIA.

A new phase of the milling industry has come into being in California within the past few years. This is the manufacture of alfalfa meal. At first it had a slow growth, but persistent effort on the part of promoters finally triumphed.

There are five alfalfa milling plants in the State, and alfalfa meal is one of the staple commodities found in nearly every feed store on the Pacific Coast.

It has been discovered that this is the most economical method of putting alfalfa hay on the market.

This class of forage was first put on the market loose; then it was baled, but at best there was much waste. The leafage, which, on being dried, is very tender and brittle, shells badly in handling, and thus the more valuable part of the hay is lost.

In feeding out there was also a waste in roughage. Sheep are inclined to leave the coarser stalks, and these leavings are in some cases fed to cattle, who are not quite so fastidious.

But the grinding of alfalfa hay into meal has not yet been fully adapted to general stock feeding, but as a feed for hogs, dairy cows, and poultry it has been found par excellence. The milling process not only reduces the leafage of the plant to a fine powder, but grinds all the roughage to such a consistency as to be perfectly edible, and thus the entire bulk of the forage is made available for animal food.

The California alfalfa mill thus far is a stationary affair, and the machinery of a very simple character.

It is probable, however, that portable mills will be invented, whereby the alfalfa hay may be converted into meal in the field, and thus a greater saving of fibre be accomplished.

The milling of alfalfa, again, is a very dusty process, and injurious to those operating the mills, who are compelled to not only dampen the hay before being milled, but to wear moistened sponges over their mouths and nostrils while at work. These difficulties will no doubt be obviated by improved mechanical appliances.

The milling of alfalfa hay in California has greatly stimulated the culture of the plant, and the industry is in a very flourishing condition. It is also bringing about improved cultural methods, especially in the way of securing pure culture, as weedy and foul alfalfa will hardly do for conversion into meal.

Alfalfa is packed in 100-lb. sacks, and the commodity at present (December) retails at 95 cents per sack (approximately £4 9s. per ton).—*Milling Journal*, 12th December, 1914.

THE OLIVE.

L. Macdonald, Horticulturist, Agricultural College, Dookie.

(Continued from page 228.)

VARIETIES—*continued.*

In Asia Minor, Tripoli, Algiers, Tunis, and Morocco, where the olive has been cultivated for many generations, it is only to be expected that a great number of varieties exist. Many of these may possibly be worthy of more extensive cultivation than has been attained up to the present. *It is probable, also, that some of those specially adapted to the dry lands, in the above-mentioned places, would be suited to our* inland areas. An olive of great vigour, drought resisting, prolific, and a high oil yielder is required to withstand the trying conditions of some of our drier regions, and at the same time give profitable returns. Such an olive, if planted with sufficient care, and tended in its early years, would be the means of appreciating the land values of fairly extended areas where the rainfall is not great and irrigation cannot be practised.

It has always been recognised that with olives, as with some other kinds of fruits, certain kinds will succeed better than others in different localities where different conditions prevail. This being so, the problem of the planter is the selection of those kinds that will do best in his region or district, while possessing those qualities that are most sought after in the kind, whether it be for oil or pickles. In selecting such varieties, a review is necessary of the kinds growing successfully in regions where the conditions are similar to those prevailing in the places where planting is intended. This would be the means of at least eliminating one of the factors that has contributed to the failure of some olive orchards.

According to Californian and European experience it has been found *that certain varieties, as Oliviere and Navidillo Blanco, which do not* succeed well on low-lying, moist lands, give an oil of inferior quality, and in lesser quantities, and are subject to frost injury. The susceptibility to frost injury is, of course, more marked with some varieties than with others, but with the susceptible kinds it appears to be more pronounced under the moist conditions of the valley lands. Others, like Mignolo, Morajolo, Gordal, &c., favour greater elevations, and will thrive in more exposed situations in well-drained land. Such kinds are usually dense, but not tall in growth, and their fruit adheres strongly to the fruit stalks.

An interesting and instructive account is contained in Bulletin No. 125 of the United States Department of Agriculture on dry land olive culture in Northern Africa.* It chiefly refers to the plantations around the city of Sfax, some 200 miles south of Tunis. In this region the average rainfall is 9.3 inches, but this falls, for several years at a time, to an average of 6 inches; yet around this city in 1909-10, 475,000 acres were devoted to olives. This area has probably been increased during the last five years to 500,000 acres. This expansion has been made, despite the fact that the rainfall is scanty, the soil poor, and there is no irrigation (except hand watering in the early years).

It has been due mostly to clean cultural methods, spacious planting and the adoption of the right kind. The Chemlaly variety is the kind

* Dry Land Olive Culture in Northern Africa.—Thomas H. Kearney.

almost exclusively grown. It is remarkable for its drought-resisting qualities, prolificacy, and the abundance of oil it yields. It is a kind that has not yet been introduced here, but it is only reasonable to suppose that it would thrive in the comparatively dry lands here, at least in the northern areas that are served by a 15 to 20 inch rainfall, and possibly in those free soils where the rainfall is between 10 and 15 inches. However, the range of markets for the oil of this kind is not so great as that for some of the European kinds owing to its extraordinarily high percentage of stearin. This quality renders the oil liable to congeal at comparatively high temperature. Thus, in the more temperate and colder climates, this oil cannot be adapted to many of the uses to which olive oil is put. Therefore, the limits of its markets fall short of that of many of our European oils. However, this disadvantage of "freezing" is not noticeable in warm climates, and it is doubtful if it would be a serious obstacle in the marketing of its oil in the greater portion of Australia. The Chemlaly variety, according to the report referred to, gives 30 per cent. of recoverable oil in factories where modern machinery is in use, and 34½ per cent. of oil under chemical extraction tests. This is an exceedingly rich oil test, and, combined with its vigour and ability to thrive under dry conditions, makes this variety one of the most presentable for trial in our dry areas.

There is evidence also that olives were grown over a large area in Northern Africa 1,500 years ago, where the rainfall is only 8 to 14 inches. This rainfall would embrace huge areas of our dry inlands, many of which are rich and permeable, but only lacking in a sufficiency of moisture to assert their latent wealth. However, it is not quite clear at what times the rains fall in this part of Northern Africa, and, of course, without accurate data on this particular point a comparison as to the suitability of our lands cannot be made. It appears to be essential for the olive to obtain good supplies of moisture in spring, about the period of flowering and setting of its fruit: and then again towards the latter part of summer, when the fruit is approaching maturity.

Around Sfax the trees are planted 65 to 80 feet apart, hand-watered and carefully tended in their early years. The watering in the early years is very essential to give the young trees a start. To obtain the necessary water for this purpose wells are sunk at intervals throughout the groves. The wells are taken down with three straight sides and one slanting side from which the water is approached. Once the trees are established thorough cultivation is adopted to conserve all the moisture possible. One man cares for about 225 trees, but where the man possesses a family of several, capable of working, 600 trees can be taken care of.

In his work on the olive, Degrully describes several Algerian and Tunisian varieties, amongst which Chemlaly, Limli, Aaleth yield good oils, whilst Adjeraz, Aberkan, Tefah, Barouni, Bidh-el-hamam, and several others, of large size, are excellent for pickling. It does not appear as though Northern Africa and Asia Minor have been systematically searched, and the most promising kinds selected and tested in different soils for comparative purposes. Such a search would, no doubt provide much of interest and value on the olive question, and no doubt reveal some kinds of great economic value.

It would appear by the evidence before me that there are only a limited number of varieties worthy of planting for commercial purposes (oil or pickles) in this country out of the great number of kinds presented to us by European cultivation. Growers must debar the inferior kinds of olives a place as firmly as they do the inferior kinds of apples. The data available in Australia as yet on the economic value of the various kinds is very meagre. In New South Wales some good work has been done, and is, I believe, being continued at different stations, *the investigations carried out in this direction at the Wagga Experiment* Farm being of special value. In South Australia a considerable number of practical tests have been made from time to time by some of the growers, and valuable records kept. Those obtained from the Beaumont plantation extend back as far as 1875. They show the yield of olives and quantity of oil produced from that plantation for a series of years; the varieties, however, are not carefully separated. So far as Australia is concerned, the best European and African varieties have not yet been tested in the various regions that would probably be suitable for olive culture; and accurate records kept of their behaviour in regard to prolificacy, size of fruit, richness in oil, and adaptability to conditions. This is unfortunate, but to some extent inevitable, as the industry is in its infancy. However, a beginning has been made, and it is expected that the next few years will yield some further information on the subject. For the present we are perforce compelled to fall back on the experience gained in California and Europe. European experience appears for the most part to be empirical, and is based more on the practical results obtained in some districts than on accurate laboratory or milling tests. Practical tests with extensive quantities are of great value, probably more value than chemical tests, in showing the recoverable oil content of any kind, but they are somewhat cumbersome for advance work. Such tests as the Provincial European are usually based on individual methods, which naturally vary very much, according to the mechanical effectiveness of different crushers and presses, thoroughness in working, time of picking, &c. To obtain any degree of accuracy for comparative work the same mechanical means for expressing the oil should be used in each case, and the methods of treating the olives and time of picking should also be made to correspond as near as possible.

The transitions that take place in the development of the oil cells in the different varieties have not been accurately ascertained. Some kinds may develop more oil than others after the time which is regarded as the most suitable at which to pick. It is fairly well known that olives as a rule will yield considerably more oil when they are dead ripe than when they have just reached the stage when they may be picked for making fine quality oil.

Again, recoverable oil content is a variable factor, depending greatl on the climatic and soil conditions and on season of pressing. If the weather is cold and frosty, the oil congeals, and will not leave the pulp; hence, early varieties are favoured in some places, even though their absolute oil content may not be as great as other kinds that ripen later: being treated in the warmer weather their oil runs more freely, and they can also be picked with few of the disabilities that accompany winter gathering. *If temperatures can be controlled by artificial heating in* the mill (this heating should be an important consideration in the design

of every modern oil-making establishment), any disabilities in respect to the hardening of the fats in the pulp may be greatly modified, if not removed.

It has been demonstrated in the extensive tests carried out under the *ægis* of the Californian University, that with some varieties there is a considerable fluctuation in actual oil content. This being so, it is only reasonable to suppose that a similar difference would be found in the recoverable oil from the same kind. The Californian growers, more than others, appear to have fined down the number of kinds worthy of planting for commercial purposes. These have been reduced to about half-a-dozen kinds; in fact, many regard two only as being worthy of consideration, viz.: Broad-leaved-mission and Manzanillo. In Europe it is found that growers still adhere to those kinds that have been grown for many years, generations, and even centuries. This is due in part, perhaps, to their reluctance to part with old trees that have served them well. For instance, we have the Razza, Mignolo, and Correggiola in the provinces of Lucca and Pisa, in Italy; the Verdale in the valley of the Hearault, France; and the Veral Blanco and Navadillo Negro in the province of Jaen, Spain. However, some kinds, like Manganillo, Picholine, Gordal, Oliviere, Pleureur, &c., find more general favour, and are grown through different provinces in different countries. It has been the endeavour here to gather together all the available information as to the vigour, hardihood, prolificacy, and oil-bearing capacity of the various kinds, as shown by their culture in other countries, and to use this experience to our own advantage in establishing groves of only the best kinds. Although different varieties vary in their oil content in different localities, this variation is not so great as the difference in oil content between some kinds.

After giving some consideration to the kinds enumerated, and to those factors that are required in a commercial kind, and knowing that it is neither a good thing for the individual grower nor the industry to adopt too many kinds, we would recommend nurserymen and others to make a selection from the following list, which contains those that possess the greatest credentials for planting here:—

Broad-leaved-mission, Correggiola, Pleureur, Razza, Manzanillo, Picholine, Sevillano, Hardy's Mammoth, Pigale, Pendoulier, Bouteillan, Ascolano, Gordal, Oblitza, Verdale, Herbiquina (?), Chemlaly.

If this list is reduced to a more select choice of kinds for oil and pickles, the following are recommended:—

Oil Varieties—

Broad-leaved-mission.
Correggiola.
Pleureur.
Razza.

Pickling Varieties—

Manzanillo.
Sevillano.
Picholine.
Ascolano.

Dual-purposes Varieties—

Mission.
Manzanillo.
Verdale.

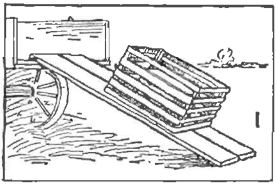
Strong-growing kinds for shelter belts that will give valuable produce are:—Pigale, Oliviere, Navadillo-Blanco, Salouen, Mission.

The kind known as *Ackbucke* is largely employed as stock, and the Empeitre for hedging purposes. Seedlings of various kinds planted close together are also used for hedging purposes.

(To be continued.)

LOADING HOGS WITH CRATE.

For loading hogs (writes an American farmer) I use a crate without a floor. This I place over the hog or let in through the door in the end. Two planks 10 or 12 feet long are used instead of a chute, one end resting in the end of the waggon box and the other on the ground. I then take hold of the crate and slide it up the planks, with the hog walking backwards, as shown in the illustration. As the



crate touches his nose, he will back up the planks and into the waggon. I then pass a rope over the crate and fasten it down. If the hog is to be loaded into a car, I set one end of the planks on the waggon and the other in the car door, and slide the crate along the planks into the car. I have loaded hogs alone in this way that weighed 600 lbs. A crate used for this purpose should be made with slats close together so that the hog cannot get its nose between them.

VICTORIAN RAINFALL.

First Quarter; Year, 1915.

In the following table is given the average rainfall in each district in Victoria for the first three months of the year, and also for the quarter compared with the normal. For the purposes of this table 180 representative stations have been chosen, mainly with due regard to geographical position of the stations, their general peculiarities with respect to rainfall distribution, and their importance from an agricultural standpoint.

Droughty conditions with their attendant ills involving great losses in stock still prevailed up to the end of March almost throughout the State, excepting the Gippsland district. The greatest deficiencies with regard to rainfall, it will be noted, prevailed in the Northern Mallee,

and the lower North-East. In fact, in all the Northern areas very little rain had been received, and the want of a good fall was very badly felt, there being no pastures, and hand-feeding of stock and carting of water for domestic purposes being almost universally adopted. Even in the Western districts, where droughty conditions are very rare, the season has been the worst on record. Most of the creeks and rivers were low or had ceased to flow, and feed for stock was scarce. The general outlook was anything but promising, and the severest drought on record in Victoria was being experienced.

But conditions have since somewhat changed, and the gloomy outlook has been dissipated, consequent on the beneficial falls which have visited the State during the period 8th to 12th April. In most cases sufficient rain was received to enable farmers to plough their fields, and prepare for the coming season, the water supplies have been partially replenished, and an impetus given to the grass. No improvement has been noted with regard to the flow of rivers.

The most favoured areas were the Central and North Central districts, where the averages for the period were 169 and 146 points respectively; 113 points were received on an average throughout Gippsland, and ranged from 261 at Leongatha to 6 points at Ensay. The Wimmera district mean for the period was 89 points, the Western 88, and the Northern country 80 points. The Mallee district participated to a lesser amount, but more rain is still badly needed in that part of the State. The falls ranged from 37 at Ouyen to 106 points at Rainbow.

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	45	0	0	45
	Normal	58	56	80	194
	Per cent. above normal	..	..	..	..
	,, below ,,	−22	−100	−100	−77
Mallee South	District Mean.. ..	52	37	3	92
	Normal	57	67	90	214
	Per cent. above normal	..	..	..	..
	,, below ,,	−9	−45	−97	−57
Northern Wimmera ..	District Mean.. ..	50	16	4	70
	Normal	64	71	105	240
	Per cent. above normal	..	..	..	..
	,, below ,,	−22	−78	−96	−71
Southern Wimmera ..	District Mean.. ..	65	22	16	103
	Normal	93	70	113	276
	Per cent. above normal	..	..	..	..
	,, below ,,	−30	−69	−86	−63
Lower Northern Country	District Mean.. ..	61	44	5	110
	Normal	90	72	114	276
	Per cent. above normal	..	..	..	..
	,, below ,,	−32	−39	−96	−60

VICTORIAN RAINFALL—*continued.*

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Upper Northern Country	District Mean	71	50	3	124
	Normal	116	88	146	350
	Per cent. above normal	..	..	..	..
	,, below ,,	−39	−43	−98	−65
Lower North-East ..	District Mean	96	29	19	−144
	Normal	154	139	226	519
	Per cent. above normal	..	..	..	..
	,, below ,,	−38	−79	−92	−72
Upper North-east ..	District Mean	183	54	42	279
	Normal	217	185	275	677
	Per cent. above normal	..	..	..	..
	,, below ,,	−16	−71	−85	−59
East Gippsland ..	District Mean	553	58	107	718
	Normal	256	231	222	709
	Per cent. above normal	+116	..	..	..
	,, below ,,	..	−75	−52	+1
West Gippsland ..	District Mean	196	95	111	402
	Normal	229	169	260	658
	Per cent. above normal	..	..	..	..
	,, below ,,	−14	−44	−57	−39
East Central	District Mean	194	85	77	356
	Normal	233	183	274	690
	Per cent. above normal	..	..	..	..
	,, below ,,	−17	−54	−72	−49
West Central	District Mean	152	71	31	254
	Normal	146	122	194	462
	Per cent. above normal	+4	..	..	..
	,, below ,, ..	..	−42	−84	−45
North Central ..	District Mean	125	105	19	249
	Normal	142	113	174	429
	Per cent. above normal	..	..	..	..
	,, below ,, ..	−12	−7	−89	−42
Volcanic Plains ..	District Mean ..	104	23	41	168
	Normal	139	113	194	446
	Per cent. above normal	..	..	..	..
	,, below ,, ..	−25	−80	−79	−62
West Coast	District Mean	124	44	124	292
	Normal	148	112	195	455
	Per cent. above normal	..	..	..	..
	,, below ,,	−16	−61	−36	−36

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

20th April, 1915.

VICTORIAN AGRICULTURAL STATISTICS.

Area and Produce, 1913–14 and 1914–15.

Name of Crop.	Area.		Produce.		Average per acre.	
	1913–14.	1914–15.	1913–14.	1914–15.	1913–14.	1914–15.
	acres.	acres.	bushels.	bushels.	bushels.	bushels.
Wheat	2,565,861	2,863,535	32,936,245	3,940,947	12·84	1·38
Oats	442,060	434,815	8,890,321	1,608,419	20·11	3·70
Barley (malting)	44,584	31,268	971,334	368,647	21·79	11·79
Barley (other)	38,767	31,224	841,556	231,952	21·71	7·43
Maize	17,962	19,433	800,529	†	44·57	†
Rye	1,779	1,955	19,029	13,415	10·70	6·86
Peas	11,774	12,159	206,846	114,493	17·57	9·42
Grass cut for seed	1,452	149	16,349	1,100	11·26	7·38
			tons.	tons.	tons.	tons.
Potatoes (early crop)‡	7,704	6,077	27,121	15,788	3·52	2·60
Potatoes (general crop)	66,870	50,418	149,481	†	2·24	†
Mangel-wurzel	952	893	15,642	†	16·43	†
Beet, Carrots, Parsnips, Turnips for fodder	470	570	3,166	†	6·74	†
Onions	6,121	8,037	24,755	†	4·04	†
Hay (wheaten)	220,560	192,562	274,981	96,604	1·25	0·50
Hay (oaten)	720,678	677,895	1,037,174	441,490	1·42	0·65
Hay (lucerne, &c.)	27,446	25,298	38,219	30,862	1,39	1·22
Green Fodder	98,963	139,654				
Vines	22,435	23,798*				
Orchards and Gardens	67,183	74,302				
Market Gardens	10,777	12,935				
Other Tillage	7,923	8,084*				
Total area under crop	4,391,321	4,624,961*				
Land in fallow	1,738,572	1,346,545				
Total Cultivation	6,129,893	5,971,506*				

* Subject to slight alteration. † Not yet available. ‡ The early crop relates to potatoes dug before 1st March.

Area Under Potatoes in Principal Counties, 1913–14 and 1914–15.

Principal Counties.	Area in Acres.	
	1913–14.	1914–15.
Bourke	7,951	6,508
Grant	10,557	8,898
Mornington	11,276	12,372
Dalhousie	3,840	3,228
Talbot	8,872	6,804
Villiers	5,708	5,392
Buln Buln	8,031	8,393
Remainder of State	18,339	13,900
Total	74,574	65,495

Office of the Government Statist,
Melbourne, 28th April, 1915.

A. M. LAUGHTON,
Government Statist.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commencing 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breed.	Owner.	Totals. 15.4.15 to 14.6.15	15.6.15 to 14.7.15	Three months.	Position in Competition.
		LIGHT BREEDS.				
		Wet Mash.				
19	White Leghorns ..	L. G. Broadbent ..	271	117	388	1
53	.. ..	W. G. Swift ..	244	129	373	2
2	.. ..	E. A. Lawson ..	244	124	368	3
21	.. ..	E. B. Harris	236	131	367	4
38	.. ..	G. McDonnell ..	227	137	364	5
5	.. ..	J. J. West	220	132	352	6
8	.. ..	C. J. Jackson	237	113	350	7
42	.. ..	W. M. Bayles	223	123	346	8
7	.. ..	Marville Poultry Farm	232	113	345	9
9	.. ..	J. Schwabb ..	238	107	345	9
34	.. ..	H. McKenzie and Son	243	98	341	11
6	.. ..	F. Doldissen ..	240	101	341	11
10	.. ..	A. E. Tuttleby	201	131	332	13
30	.. ..	A. E. Silbereisen	231	97	328	14
18	.. ..	D. Adams	210	116	326	15
16	.. ..	N. Burston	218	102	320	16
26	.. ..	A. Mowatt	205	109	314	17
44	.. ..	Mrs. F. M. Oliver	204	109	313	18
25	.. (5 birds)	Giddy and Son	207	100	307	19
4	.. ..	R. Hay ..	209	96	305	20
32	.. ..	F. Hodges ..	210	89	299	21
60	.. ..	H. C. Brock	222	67	289	22
28	.. ..	R. Lethbridge	176	112	288	23
52	.. ..	A. A. Sandland	216	69	285	24
3	.. ..	J. H. Gill	194	90	284	25
1	.. ..	Mrs. H. Stevenson	193	90	283	26
50	.. ..	John Hood	169	112	281	27
49	.. ..	Bennett and Chapman ..	159	121	280	28
51	.. (5 birds)	A. H. Mould	206	73	279	29
39	.. ..	W. M. Sewell ..	206	73	279	29
15	.. ..	H. N. H. Mirams	176	93	269	31
11	.. ..	J. B. Brigden ..	163	105	268	32
57	.. ..	B. Mitchell ..	179	89	268	32
33	.. (5 birds)	A. W. Hall	211	55	266	34
23	.. ..	Fulham Park	167	97	264	35
24	.. ..	Lysbeth Poultry Farm ..	156	107	263	36
13	.. ..	T. Hustler	153	105	258	37
43	.. ..	H. I. Merrick	161	96	257	38
36	.. ..	Weldon Poultry Yards ..	183	71	254	39
54	.. ..	W. G. Clingin	151	102	253	40
40	.. ..	C. C. Dunn	165	88	253	40
59	.. ..	W. G. Osburne	154	96	250	42
55	.. ..	W. N. O'Mullane ..	154	90	244	43
48	.. ..	C. J. Beatty	167	76	243	44
14	.. ..	W. Flood	144	90	234	45
47	.. ..	J. C. Armstrong ..	160	67	227	46
45	.. ..	South Yan Yean Poultry Farm	130	88	218	47
20	.. ..	R. W. Pope	155	61	216	48
12	.. ..	G. Hayman	141	63	204	49
58	.. ..	Thirkell and Smith ..	117	84	201	50
22	.. ..	S. Buscumb	151	47	198	51
41	.. ..	J. A. Donaldson ..	112	85	197	52
27	.. ..	J. A. Stahl	90	103	193	53
46	.. ..	R. Berry	159	31	190	54
56	.. (5 birds)	C. Hurst	95	73	168	55
37	.. ..	A. Ross	97	70	167	56
31	.. ..	L. McLean	96	7	103	57
		Total	10,478	5,320	15,798	

Fifth Victorian Egg-laying Competition, 1915–16—*continued.*

Six Birds. Pen No.	Breed.	Owner.	Totals. 15.4.15 to 14.6.15.	15.6.15 to 14.7.15.	Three months.	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
80	White Leghorns ..	W. H. Robbins	280	144	424	1
69	.. ..	E. MacBrown	207	125	332	2
68	.. ..	H. McKenzie and Son ..	213	103	316	} 3
64	.. ..	W. M. Bayles	229	87	316	
78	.. ..	H. Handbury	193	117	310	5
72	.. ..	Mrs. E. Zimmerman ..	224	73	297	6
79	.. ..	Lysbeth Poultry Farm ..	233	61	294	7
66	.. ..	E. A. Lawson	240	40	280	8
76	.. ..	A. A. Sandland	163	90	253	9
71	.. ..	Moritz Bros.	155	92	247	10
65	.. ..	Thirkell and Smith ..	171	59	230	11
67	.. ..	C. C. Dunn	170	59	229	12
63	.. ..	A. H. Padman	123	78	201	13
62	.. ..	*Benwerren Egg Farm* ..	183	11	194	14
61	.. ..	Mrs. H. Stevenson ..	71	91	162	15
75	.. ..	Fulham Park	69	87	156	16
74	.. ..	J. H. Gill	61	69	130	17
77	.. ..	South Yan Yean Poultry Farm	75	34	109	18
73	.. ..	C. L. Lindrea	34	41	75	19
		Total	3,094	1,461	4,555	
		HEAVY BREEDS.				
		Wet Mash.				
81	Black Orpingtons ..	Mrs. T. W. Pearce ..	275	127	402	1
100	.. ..	J. H. Wright	270	128	398	2
97	.. ..	Marville Poultry Farm ..	241	120	361	3
94	.. (5 birds)	D. Fisher	227	113	340	4
86	.. ..	C. E. Graham	181	153	334	5
90	.. (5 birds)	Oaklands Poultry Farm ..	227	104	331	6
85	.. ..	H. H. Pump	192	134	326	7
88	.. ..	J. McAllan	199	95	294	8
89	Rhode Island Reds	E. W. Hippe	181	110	291	9
87	Black Orpingtons ..	W. C. Spencer	172	113	285	10
99	.. ..	L. McLean	188	93	281	} 11
91	.. ..	A. Greenhalgh	182	99	281	
96	White Orpingtons ..	Stranks Bros.	204	65	269	13
95	Silver Wyandottes ..	W. H. Forsyth	163	86	249	14
84	Black Orpingtons ..	Cowan Bros.	137	104	241	15
93	.. ..	L. W. Parker	108	125	233	16
83	.. ..	G. Mayberry	126	66	192	17
92	.. ..	J. Ogden	66	103	169	18
98	Faverolles ..	K. Courtenay	38	79	117	19
82	White Wyandottes	J. B. Brigden	—	14	14	20
		Total	3,377	2,031	5,408	

Report for Month Ending 14th July, 1915.

The weather during the month was cloudy with much north-west wind and light rains. There was an extremely heavy frost on the 14th July, the thermometer registering under 30 degrees Fahrenheit.

The birds have done well for the period, the heavy breeds doing fine work. Quite a number of birds in the light breed section went into the moult. There were also a few broodies.

The rainfall for the month was 233 points.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard

If the winter spraying has not been carried out, it should be done without delay. One of the most general winter sprays is red oil. The caustic properties of this oil are well known; and in order that no damage shall arise from burnt buds, it is advisable to finish the red oil spraying immediately. Once the buds commence to move, all oil preparations should be kept from the trees. It has previously been stated that a strength of 1 in 30 of red oil is amply sufficient to destroy such pests as Bryobia mite, Scale insects, and Woolly aphis: when the oil is used late in the season, it certainly should not be sprayed at a greater strength than this. Red oil may be emulsified by combining it with soft soap, using 1 lb. of soft soap to 1 gallon of water; or it may be used in combination with lime, using 1½ lbs. lime, dissolved in water, to 1 gallon of oil, afterwards reducing this down wth 30 gallons of water. Many of the red oils now sold are in a prepared form, the oil merely requiring the addition of a small proportion of washing soda to the water before mixing. Crude petroleum or kerosene may also be used in an emulsified form for a winter spray, but general practice has shown that the red oil is the superior of all oil emulsions.

A watch will need to be kept for peach aphis, which makes its advent in the spring. This insect multiplies so rapidly, once it does appear, that, on the first indication of its presence, the trees should be sprayed with a strong tobacco solution. They should be examined on the day after spraying, and if any aphides are still alive, another spraying should be given.

A vigilant watch, and constant sprayings in the early season, will check this pest, and will be the means of saving much time next month, when it will be urgently needed for other works. Peach, almond, and Japanese plum trees are attacked by the peach aphis. This is also the season when Bryobia mite (red spider) is hatching and breeding. If the trees have received an oil emulsion in the winter no danger may be feared from this mite. But if not, an effort must be made to keep it in check by spraying the trees with strong nicotine solution or with one of the proprietary mixtures now on the market. The foliage and young buds are greatly damaged by the attacks of this mite, and so to allow full leaf action, it should be attacked before the flowers and foliage come.

The work of planting will also require to be finished before the end of the month. Indeed, it is not advisable to defer planting even so late. It has often been advanced by growers that late-planted peaches thrive far better than early-planted ones; but it is as well to get the trees in as early as possible, in the event of the season setting in early.

Preparation should now be made for planting oranges and lemon trees. These may be lifted and planted out as soon as the season sets

in warm; but the soil should be thoroughly drained and sweetened before these trees are planted in their permanent positions. No trees require so thoroughly an aerated soil as the citrus family, and to insure successful growth, the ground should be placed in good heart before planting. Although planting this class of fruit trees may be delayed until mid-summer, it is advisable to plant them as soon as the soil is warm enough to induce new root growth, so that they may thoroughly establish themselves during the first season.

Vegetable Garden.

The work in this section during the month of August is comparatively light, provided that it has previously been kept up to date. The soil should be mellowing and sweetening, in anticipation of the planting of the main crop in a little while.

Seeds of lettuce, tomato, cabbage, peas, radish, and broad beans may now be sown. Potatoes may be planted out. Where a frame and hot-bed are in use celery, cucumber, vegetable marrow, tomato, and pumpkin seeds may be planted.

All seedlings ready for planting out, such as cabbage, cauliflower, onion, and lettuce may now be planted in the beds. Herbs of all descriptions should be sown.

Flower Garden.

Rose pruning should now be completed. At this time the buds are beginning to swell and to show some prominence, and no check should be put in the way of their full development. A careful watch should be kept for the appearance of aphis, which should be washed off as soon as it is noticed. It is advisable to have a specific always on hand, ready made up, so as to kill the aphis when noticed. The aphis is a very rapid breeder, and delay for a few days means an enormous increase of this pest. Quite a number of specifics are useful in combating the aphis—soaperine, tobacco emulsion, strong soap suds, Robinson's pine spray, and pestend solution are among the useful remedies. Whatever is used, a good application should be given, and it should be repeated at frequent intervals if the aphides remain.

All herbaceous and similar plants may now be planted out in the beds; these include delphinium, cannas, shasta daisy, rudbeckias, salvias, perennial phlox, &c. These plants should be well fed, so as to allow them to make a rapid and vigorous growth.

Weeds will need frequent attention, as they must be kept in check at this time of the year; they should be prevented from seeding in the beds.

The planting out of shrubs may now be continued and completed as early as possible, so as to allow the roots to get a good hold of the soil before the hot weather sets in. Gladioli may be planted for early flowering, and as well a few divisions of tubers of dahlias.

WINTER FLOWERS.

In the months of June and July flowers are less abundant in the garden than at any other time. All the rest of the year the gardener has no difficulty in obtaining cut flowers.

There are quite a number of shrubs and some plants which produce an abundance of blossom in the winter time, and most of these may now be planted.

The old and well-known scarlet favourite, Japanese Quince, Pyrus Japonica, with its pink and white varieties, can always be relied upon for flowers. The many pink and white varieties of the Japanese Quince and Apricot fill the garden with beauty and fragrance in June and July. These shrubs should be more cultivated than they have been.

Libonia floribunda, a dwarf growing plant, produces a number of scarlet and yellow blossoms, and with its dark foliage it has not been inaptly named, the Belgian flower.

Jonquils, Snowflakes, Camellias, Violets are all in flower at this time; one species of Camellia, C. sasanqua, is very beautiful, with its abundance of bright pink flowers. There is also a variety with variegated foliage. The tree heath, Erica arborea, and as well many other Ericas, produce their flowers in the winter; and the Cape Wedding flower, Dombeya Natalensis, is always a mass of snowy bloom, except when the frost browns the flowers. Several species of Hambrothamus, the old-fashioned Marguerite, with the new double variety, Mrs. Sander; Berberis Darwinnii, with its orange blooms; several species of Abutilon; several species of Cassia; Jasmimum primulinum, the yellow Jasmine, are all plants producing winter flowers. The winter flowering Iris stylosa will produce a great quantity of blooms from May to September, and is always a good plant for brightening the garden in the dull season. Eucalyptus Lehmannii is fairly dwarf growing, and may be planted in large shrubberies; while Acacia retinodes, A. podylariæfolia, are also winter flowering species. So that if a selection be made from the above plants the garden will produce its beauty in the winter as well as at any other time.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Still continue to feed stabled horses well; feed green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Continue giving hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Feed stallions doing stud duty liberally. *Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.*

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. *Have feeding troughs or buckets clean. Don't over-feed.* Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or

sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Considering the present high price of pork, there should be a good margin of profit in fattening pigs, even at the high price asked for feed. (*See* page 447, *Journal of Agriculture for July, 1915.*) Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Lambs not good enough for freezing also thrive better after being shorn. Where sufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting. Only heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing.

Poultry.—September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with Bordeaux mixture as the blossom buds are opening, as a preventive against "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

Vineyard.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab with acid iron sulphate vines which showed signs of Black Spot last season. To avoid burning, this must be completed before the buds commence to swell. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 9. 10th September, 1915.

STANDARD TEST COWS.

Third Annual Report on the Testing of Pedigree Herds, conducted by the Department of Agriculture, Victoria, for the year ended 30th June, 1915.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

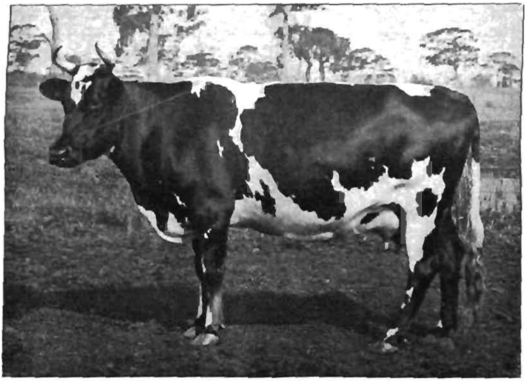
The completion of the third year of the conduct of Standard Herd Testing, marking as it does the termination of the drought, will long be remembered by dairy farmers who, from the severity of the period passed through, find themselves with depleted herds and stocks of fodder conspicuous by their absence. The period might be described as the end of the first chapter of a very severe lesson. The second chapter has yet to be written, and it will be a long one, for it must cover the period of re-stocking. Hope, however, will be a very strong factor for the success of the future, and, if directed in the right channels, the past losses may yet prove a blessing in disguise. The dairymen have it in their own hands to build the industry on a firmer footing than has hitherto existed.

For some considerable time past the average cow of Victoria has been kept at a loss to the farmer. In spite of this, dairying has been a paying industry, yet the full profits possible have not been obtained, for the cows above the average have been carrying and paying for many below, before a profit could be shown. Various estimates have been made from time to time as to the cost per annum of keeping a cow. It, of course, varies in different districts. For purposes of illustration, let the cost be stated at £8 per annum. This means that a cow will be required to give 160 lbs. of butter fat at 1s. per lb. before she pays for her keep and begins to give a profit to her owner. If she gives less than this amount then she is producing butter fat at more than 1s. per lb.,

Scottish Queen of Gowrie Park.

OWNER—W. P. BRISBANE.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914 ..	273 ..	12,022 ..	4·87 ..	585·13 ..	667 ..	21



Ida of Gowrie Park.

OWNER—W. P. BRISBANE.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914 ..	273 ..	10,867¾ ..	5·1 ..	554·89 ..	632¼ ..	23
1915 ..	273 ..	11,917¼ ..	5·08 ..	605·05 ..	689¾ ..	26½

and some other cow in the herd has to make good the difference. If, on the other hand, she is making, say, 320 lbs. of butter fat at a cost of £8, she is producing it at 6d. per lb., and giving a profit of 6d. per lb. to her owner, or £8 per annum. It is therefore clear that to attain maximum results, the "passenger" cow must be eliminated. This may be done in two ways—first, by testing and detecting the useless individual and putting her out of the milking shed; and secondly, by breeding up to better milking qualities. The effect cannot be immediately attained by either way, but a firm foundation can be laid to save both time and labour, and the present is an opportune time to lay such foundation.

Fortunately, the effect of drought was first felt amongst the "duffers," and many a useless individual has found her proper place during recent months. The remainder will not, of course, all be good milkers, yet they will all be needed, and may be potential for good by breeding to bulls with milking characteristics.

Bonny Bess of Gowrie Park. Fairy of Willow Vale.

OWNER—W. P. BRISBANE.

Bonny Bess.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914	273	9,716¾	4·49	436·83	498	24

Fairy of Willow Vale.

1914	273	6,760¾	3·89	261·44	298	16

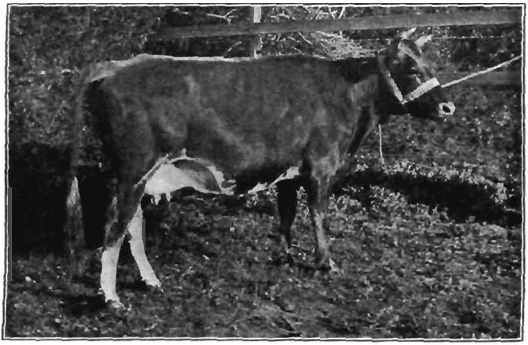
In the past, too little attention has been paid by dairyman to the influence the sire can exert, and any kind of bull, as long as he was able to get a calf, has been by many considered good enough. Fortunately, large numbers of these scrubbers have found their way to the slaughter-house as a result of the drought, and there is a clear field ahead for the introduction of pure-bred animals throughout the country, and within a few generations the average yield of milk and butter fat can be largely augmented by selecting bulls from lines of heavy yielding cows. A study of the tables in this report will indicate where such animals are procurable.

The primary object in view in the conduct of the Government herd testing is that farmers may know the strain of milk producers in the various breeds, and be enabled to select bulls capable of improving the

Wilful Venture.

Owner—P. E. Keam.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1913	273	6,381½	5·95	379·75	433	14¾
1914	273	6,872	6·27	431·19	491¼	19
1915	273	7,429½	6·46	479·85	547	19



Empire IV. of Melrose.

Owner—W. Woodmason.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914	273	7,787¾	5·64	439·63	501½	18½
1915	273	8,534½	5·61	478·13	546¾	26

herds. Even with the average cow the use of such animals will in time show beneficial results, but with cows of good quality to commence with the result will be more quickly attained. The small dairyman is, as a rule, the one who gives only small prices for his stock, and usually he gets the worst for the money. He should, as a matter of fact, pay most for the best, for it is only the rich man who can afford to keep the *unprofitable cow. If the small man would keep half, or even one-third,* of the number of cows usually kept, but have good ones, his returns would be much more satisfactory. He would have less trouble with labour—more time to devote to careful management, to the growth of crops, and generally to improve his holding. He could feed more liberally, and even though he increased the cost of feeding, he would produce his butter fat at a cheaper rate per lb. Even with the prohibitive *prices which have been ranging for food, it has paid to feed well,*

Sweetbread XXIV. (imp.).

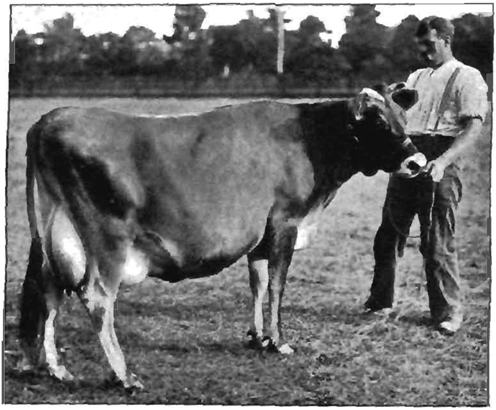
OWNER—C. D. LLOYD.

Record.	Days in Milk	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914	273	8,421	5·84	402·19	561	24
1915	273	8,504½	5·67	482·26	549¾	17

as was illustrated by a Northern District farmer, who found it advantageous to spend 1s. 6d. per day per head for feed for a herd of 29, including five heifers on first calf, getting such a return for his outlay as to show a profit of 1s. 1d. per head per day, while selling milk at 1s. 3d. per gallon, or 4d. per day if the sale of butter fat was carried out.

The foresight of another farmer in an irrigation area is worthy of record. His farm consists of 150 acres; he milked 35 cows, and received an offer of £2,000 for six months' grazing right. The tempting offer was refused, and to-day he is glad, for his stock are in splendid condition, milking heavily, and returning a handsome profit.

These are merely examples to show the confidence farmers have had in the capabilities of their cows. If further evidence is necessary, the tables herewith indicate that in spite of the adverse conditions, the general returns have been well maintained, and many individual animals have even surpassed their previous records. This aspect should be carefully considered by some breeders in the State, who have refrained from entering their herds for testing on the assumption that, by being situated in some of the poorer portions of the State, they would not compare favorably with those more favoured by natural pastures. The amount of natural pasture available during the period of this report has been a negligible quantity, yet some splendid results are shown.



Countess Twylish.

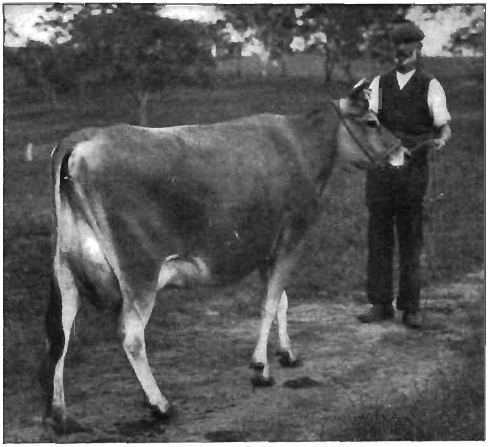
OWNER—C. D. LLOYD.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.)
1915 ..	273 ..	8,505¼ ..	5·11 ..	435·13 ..	496 ..	22

Disparaging comparisons are sometimes made between the conduct of the test as carried out in this State and in other countries. It is, therefore, not out of place to briefly outline the methods in vogue.

In the first place, it has been considered that any forcing methods whereby big records might be obtained are not in the best interests of the industry, as a tendency is developed to impair breeding quality. Commercially, it is recognised as a sound principle to breed a calf annually. With this object in view, our test is arranged to cover a period of nine months only. The cow then has an opportunity of obtaining a well-earned rest before coming into the herd again. In order to demonstrate which of the cows are longer milkers than nine

months, the weight of milk on the last day of test is always recorded. Breeders may therefore see which cows are still going strong. In a further effort to prevent forcing and false impressions as to the merits of herds by judging on the best animals only, all cows in the herd must be submitted to the test. In this way a breeder is prevented from gaining distinction for his herd by having only one animal of high quality and a bad tail end, an average of the whole herd correcting such impressions and showing the true commercial merit.



Audrey Lassie.

OWNER—C. GORDON LYON.

Record.		Days in Milk.		Weight of Milk (lbs.).		Average Test.		Butter Fat (lbs.).		Commercial Butter (lbs.).		Weight of Milk Last Day of Test (lbs.).
1913	..	273	..	4,854	..	5·2	..	252¼	..	287¾	..	..
1914	..	273	..	7,596	..	4·74	..	360	..	410¼	..	17
1915	..	273	..	7,657	..	5·04	..	386¼	..	440¼	..	15

The question of standard was the next aspect to be considered when the scheme was being evolved, and based upon the figures that were then available, 175 lbs., 200 lbs., and 250 lbs. were fixed as a minimum in each class. The following averages obtained last year indicate that such standard is somewhat lower than the actual average obtained:—

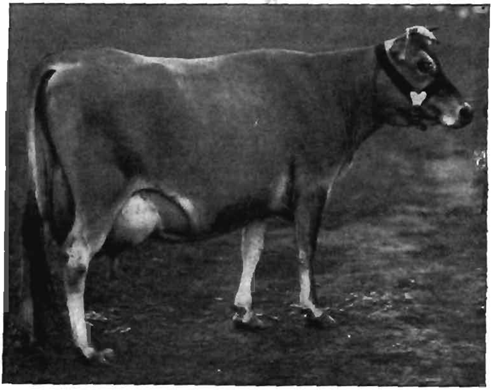
AVERAGE BUTTER FAT RETURNS FOR ALL COWS TESTED.

Standard.	No. of Cows.	Average Butter Fat.
250 lbs.	165	318·90
200 „	56	258
175 „	104	210·97
	325	273·87

Analysis of Season, 1914-15.

The cow which attained pride of place in the order of merit for the year is "Muria," one of the Red Polls at the Werribee Research Farm. Her record of 12,297 lbs. of milk with an average test of 5.74, yielding 705.88 lbs. of butter fat, or, allowing a 14 per cent. overrun, 804¾ lbs. of butter in nine months is a splendid return, and is marred by only one factor, which is, that all efforts to get her in calf at the usual period failed, and it was not until near the end of the nine months' test that success was attained. If milk was sold her return for nine months at 9d. per gallon would be £46 2 3

	£	s.	d.
If butter fat were sold her return would be—fat, at 1s. per lb.	35	5	9
Skim milk, at 1d. per gallon	5	2	5
	£40	8	2



Molly II.

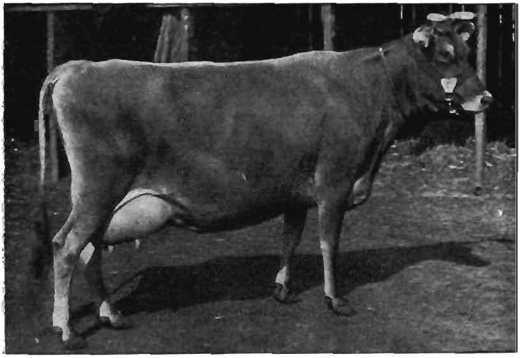
Owner—C. Gordon Lyon.

Record.	Days in Milk	Weight of Milk (lbs.)	Average Test	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test. (lbs.)
1913	273	7,440	4·85	361	411½	..
1914	273	7,429½	4·97	369½	421¼	17
1915	273	8,043	5·03	404½	461⅛	15

The cow next in order of merit was "Linda of Gowrie Park," an Ayrshire owned by Mr. W. P. Brisbane. Her return, compared with previous years, was a greater quantity of milk, viz., 13,401 lbs., but the test was slightly lower, being 4.78, while the total butter fat yield was 640.5 lbs. This cow was fourteenth in the results for 1914, when 418¾ lbs. of butter fat were obtained. She thus shows a very substantially increased

yield, and surpasses on this occasion the previous year's runner-up, "Ida of Gowrie Park," who, however, only drops back one place, though giving a much better record. In 1914 she was second with 10,867 lbs. milk—555 lbs. of butter fat. In 1915 she was third with 11,917 lbs. milk—605 lbs. of butter fat, a truly remarkable and consistent record—her test for both periods being 5.1 for 1914, and 5.08 for 1915.

Whilst the Ayrshires have the honour of holding seven out of the first ten positions, the Jersey breed again demonstrated its value, for, as will be seen from the order of merit, there comes a long run of this breed with very handsome returns comparing favorably with previous returns.



Silvermine IV.

OWNER—C. GORDON LYON.

Record.	*Days in Milk*	*Weight of Milk (lbs.).*	*Average Test.*	*Butter Fat (lbs.).*	*Commercial Butter (lbs.).*	*Weight of Milk Last Day of Test (lbs.).*
1913	273	7,591¾	5·12	388·8	443¼	20¼
1914	273	6,944	5·18	359·91	410¼	17½
1915	273	7,364	5·37	395·43	450¾	18

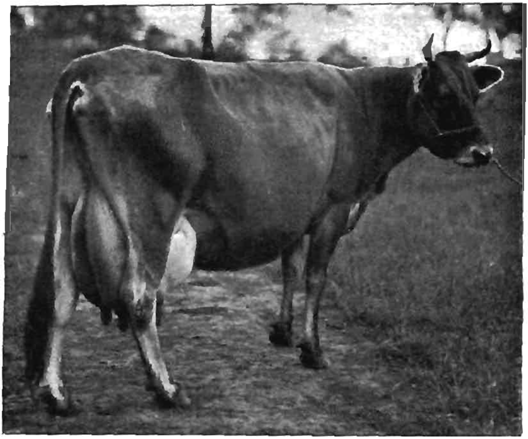
Mention may be made of "Empire IV. of Melrose," owned by Mr. W. Woodmason, which occupies fourteenth position with 479.1 lbs. of butter fat as against 439 lbs. last year, when she occupied a higher position, viz., seventh.

"Wilful Venture," owned by Mr. P. E. Keam, is thirteenth on the list with 479.8 lbs. of fat, as against ninth the previous year with 431 lbs.

"Sweetbread 24th," owned by Mr. C. D. Lloyd—twelfth this year with 482 lbs. fat, and fifth in 1914 with 492 lbs.

"Noreen," the phenomenal fifteen-year old cow of Mr. C. Gordon Lyon, fifteenth, and 471 lbs. of fat, as against 523 lbs. last year, when she attained third position, is another splendid record.

Amongst the cows under four years of age, and requiring the 200-lbs. standard, a splendid performance is put up by another Ayrshire of Mr. Brisbane, in "Moonlight of Gowrie Park," which gave 10,079 lbs. of milk, 499.26 lbs. of butter fat, and almost doubled her previous and first return when she was seventh amongst the heifers with 5,535 lbs. of milk and 258 lbs. of fat. Her test has been very consistent, only varying by .3 per cent. "Diamond of Gowrie Park" is second in this class, jumping from 22nd place in the previous return. The third position in this class goes to a Jersey cow in "Lady Grey V.", owned by Mr. A. W. Jones. This cow occupied sixth place in the previous



Noreen.

Owner—C. Gordon Lyon.

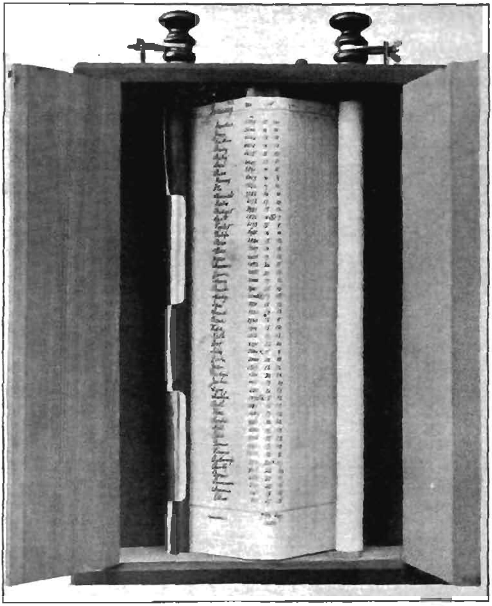
Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1914	273	11,427	4·58	523·6	597	24½
1915	273	9,896	4·77	471·68	537¾	11½

year, and her records so far mark her as a consistent and splendid butter producer. In 1914 she gave 6,437 lbs. milk; 305 lbs. fat: test, 5.62. In 1915 she gave 8,323 lbs. milk; 466 lbs. fat: test 5.61.

Amongst the heifers requiring 175 lbs. of fat to qualify for a certificate some handsome returns are recorded. Mr. Brisbane scores again in this class with "Stella of Gowrie Park," 9,398 lbs. of milk; 446 lbs. fat, and second with "Ivoline of Gowrie Park" (out of "Ida of Gowrie Park," the runner-up last year), with 8,564 lbs. of milk and 414 lbs. fat; such records would not disgrace an older cow.

A herd which calls for special mention is that of Mr. C. G. Knight, of Cobram, situated in one of the driest areas of the State, which severely felt the recent drought. The returns are commendable, especially in respect of the heifers, many of which show promise of putting up good records under more favorable circumstances.

During the period under review 21 herds have been submitted to the test—an increase of five over the previous year—and the



Record Chart Cabinet.

following table showing the averages of all herds is interesting. It should be noted that the average is based on the whole herd—not only on those cows gaining their certificates.

The highest average, 383 lbs. of fat and 8,090 lbs. of milk, or valuing fat at 1s. per lb., a return of £19 3s., without estimating the value of the skim milk, will indicate what may be attained by judicious manage-

ment. Other returns worthy of note because of the number of cows competing, which indicates the commercial basis, are those of Mr. Wm. Woodmason, with 64 cows, averaging 357 lbs. fat, or £17 17s. per cow, and the Red Polls of the Research Farm, 36 in number, averaging 314 lbs. fat, or £15 14s. per cow *for butter fat.* Further interesting figures may be seen by estimating their value if milk was sold, which all go to prove the need for more attention to be paid to the average herds of Victoria, which are far below these figures. With respect to the herds which are at the bottom of the list, it is only fair to mention that they were amongst those which felt the ill-effects of the bad season most, and had a particularly trying time; indeed, it was only with great difficulty that they were kept going long enough to complete their period.

AVERAGES OF HERDS.

No.	Owner.	Breed.	No. of Cows Completed Test.	No. of Cows Certificated.	Average Milk.	Average Test.	Average Butter Fat.
					lbs.		lbs.
1	W. P. Brisbane, Weerite	Ayshire ..	31	28	8,090·39	4·74	383·92
2	C. G. Lyon, Heidelberg	Jersey ..	15	15	7,211·81	4·99	360·02
3	C. D. Lloyd, Caulfield	" ..	6	6	6,221·75	5·71	355·36
4	P. E. Keam, Heidelberg	" ..	2	1	6,376·37	5·55	354·02
5	W. Woodmason, Malvern	" ..	64	61	6,021·06	5·61	337·74
6	A. W. Jones, Whittington	" ..	8	8	5,854·81	5·77	337·70
7	E. N. Wood, Caulfield	" ..	1	1	5,620	5·83	328·49
8	F. Curnick, Malvern	" ..	1	1	6,000	5·34	320·71
9	Department of Agriculture, Werribee ..	Red Polls	36	33	6,973	4·54	316·76
10	J. D. Read, Springhurst	Jersey ..	21	17	4,771·21	5·48	261·55
11	W. T. Manifold, Camperdown ..	Shorthorn	2	1	6,371	4·06	258·87
12	C. G. Knight, Cobram	Jersey ..	20	18	4,706·89	5·37	252·87
13	Miss S. L. Robinson, Malvern ..	" ..	7	3	4,711·5	5·35	251·91
14	D. Sadler, Camperdown	Ayrshire ..	8	8	5,637·65	4·46	251·29
15	A. Box, Hiawatha	Jersey ..	5	3	5,022·30	4·98	250·16
16	Mrs. B. M. Beckwith, Malvern ..	Dexter-Kerry	3	2	4,482	4·88	219·08
17	W. McGarvie, Pomborneit	Jersey ..	4	3	4,818·31	4·33	208·83
18	Geelong Harbor Trust, Marshalltown	Ayrshire ..	20	8	4,798·34	4·22	202·36
19	Sadler Bros., Noorat	" ..	9	4	5,098·47	3·93	200·21
20	F. J. Stansmore, Pomborneit ..	" ..	58	4	3,340·21	4·32	144·30
21	Mrs. A. Black, Noorat	Jersey ..	4	..	1,653·87	5·78	95·60

RETURN OF CERTIFICATED COWS FOR YEAR ENDING 30th JUNE, 1915.

MRS. B. M. BECKWITH, Malvern. (DEXTER KERRY).

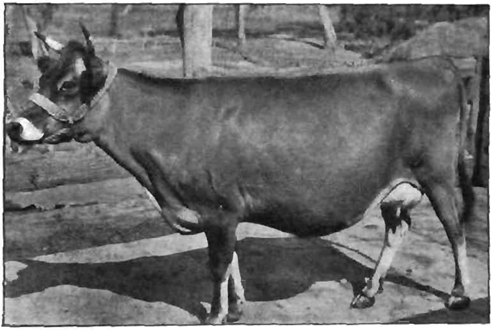
Completed during the year—3. Certificated—2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Killow ..	Not yet allotted	5.2.14	12.2.14	273	16½	5,658½	4·62	261·64	250	298¼
Colleen ..	"	3.7.14	10.7.14	266	4½	4,463¼	4·78	213·51	200	243⅓

Lady Gray 5th.

OWNER—A. W. JONES.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.)
1914 ..	2 3 ..	5,437¾ ..	5·62 ..	305·87 ..	348¾ ..	12
1915 ..	2.3 ..	8,323½ ..	5·61 ..	466·93 ..	532¼ ..	20



Tulip of Springhurst.

OWNER—J. D. READ.

Record.	Days in Milk.	Weight of Milk (lbs.).	Average Test.	Butter Fat (lbs.).	Commercial Butter (lbs.).	Weight of Milk Last Day of Test (lbs.).
1913 ..	273 ..	4,550½ ..	5·63 ..	256·17 ..	292 ..	6½
1914 ..	273 ..	4,774¾ ..	5·98 ..	285·70 ..	325¾ .	5¼
1915 ..	273 ..	6,000 ..	5·03 ..	361·57 ..	412¼ ..	8

MRS. A. BLACK, Noorat. (JERSEY.)

Completed during the year—4. Certificated—0.

H. BOX, Hiawatha. (JERSEY.)

Completed during the year—5. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Roseneath Daphne ..	3774	18.7.14	25.7.14	273	10	5,457½	5·16	281·53	200	321
Roseneath's Favourite IV.	Not yet allotted	*5.8.14*	*12.8.14*	273	*11¼*	*5,145½*	*4·30*	*221·15*	*175*	252
Larkspur's Clarabelle VI	3772	1.9.14	8.9.14	273	13½	7,088½	4·94	350·14	250	399¼

W. P. BRISBANE, Weerite. (AYRSHIRE.)

Completed during the year—31. Certificated—28.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Jean of Gowrie Park	2425	26.9.13	3.10.13	273	21	5,418½	4·75	257·56	175	293¼
Trilby of Gowrie Park	2124	28.9.13	5.10.13	273	16½	5,130¾	4·23	216·86	200	247¼
Laura IV. of Gowrie Park	*1709*	*5.10.13*	*12.10.13*	273	*10½*	*9,291¼*	*4·67*	*434·13*	*250*	*495*
Songstress of Gowrie Park	2122	8.10.13	15.10.13	273	18½	5,988½	4·33	259·26	250	295½
Tulip of Gowrie Park ..	2435	10.10.13	17.10.13	273	27½	6,588¼	4·47	294·26	175	335½
Apple Pie of Gowrie Park	2409	1.11.13	8.11.13	273	13½	4,832¾	3·98	192·16	175	219
ida of Gowrie Park ..	2423	14.3.14	21.3.14	273	26½	11,917¼	5·08	605·05	250	689¾
Blossom of Gowrie Park	2411	28.3.14	4.4.14	273	27½	10,601¼	4·94	523·77	250	597
'atch of Gowrie Park.	2430	28.3.14	4.4.14	273	20½	7,757¾	4·93	382·66	250	436¼
haffinch of Gowrie Park	2413	3.4.14	10.4.14	273	16½	7,582	5·00	378·83	250	431¾
Heather Duchess of Gowrie Park ..	1440	3.4.14	10.4.14	273	17½	7,557	4·94	373·47	250	425¾
Dolly Varden of Gowrie Park	2418	8.4.14	15.4.14	273	20	9,027	4·41	398·28	250	454
Linnett of Gowrie Park	2794	9.4.14	16.4.14	273	19½	7,783	4·61	359·09	175	409¼
Lucie of Glen Elgin ..	2109	9.4.14	16.4.14	273	15	8,334	5·04	420·19	250	479
Martha of Gowrie Park	2795	15.4.14	22.4.14	273	13½	6,529	4·88	318·39	175	363
Pretty of Gowrie Park	2797	16.4.14	23.4.14	273	32½	11,196½	4·42	494·66	250	564
Queen Bee of Gowrie Park	2798	16.4.14	23.4.14	273	13½	6,800	4·85	330·04	175	376¼
Honey of Gowrie Park	2422	17.4.14	24.4.14	273	23	12,655½	4·41	558·39	250	636½
voline of Gowrie Park	*2793*	*19.4.14*	*26.4.14*	273	*19½*	*8,564*	*4·84*	*414·78*	*175*	*472¾*
Ruby Queen of Gowrie Park	2800	20.4.14	27.4.14	273	17½	7,174¾	4·37	313·64	175	357½
Trixie of Gowrie Park	2434	20.4.14	27.4.14	273	24½	10,725	4·75	509·32	250	580½
Stella of Gowrie Park	2801	5.5.14	12.5.14	273	22	9,398	4·75	446·42	175	509
Diamond of Gowrie Park	2791	3.7.14	10.7.14	273	23	9,627¼	5·06	487·44	200	555¾
Princess of Gowrie Park	*1710*	*20.7.14*	*27.7.14*	273	12½	*8,930¾*	*4·67*	*416·78*	250	*475¼*
Moonlight of Gowrie Park	2796	23.7.14	30.7.14	273	20	10,079	4·95	499·26	200	569¼
Dairymaid II. of Gowrie Park	2415	19.8.14	26.8.14	273	20¼	*9,682	5·09	492·98	250	562
Linda of Gowrie Park..	2426	20.8.14	27.8.14	273	27	*13,401	4·78	640·50	250	730½
Laura IV. of Gowrie Park	1709	22.9.14	29.9.14	†268	25½	*10764½	5·28	568·71	250	648¼

* Sickness (fodder poisoning) affected yield towards end of term.
† *No weights for last five days, owing to an attack of mammitis.*

F. CURNICK, Malvern. (JERSEY.)

Completed during the year—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Peerless Pearl ..	3771	1.10.13	8.10.13	273	15	6,000	5·34	320·71	175	365½

DEPARTMENT OF AGRICULTURE, Werribee. (RED POLLS.)

Completed during the year—36. Certificated—33.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Goldleaf	Not yet allotted	30.9.13	7.10.13	273	10	6,895	4·49	309·50	200	352¾
Egypta	..	7.10.13	14.10.13	273	17	*6,682	4·13	275·80	250	314½
Kentucky	..	22.10.13	29.10.13	273	20	7,804½	3·96	309·02	250	352¼
Ardath	..	8.12.13	15.12.13	273	10½	5,640	4·80	270·64	200	308½
Tuckahoe	..	11.12.13	18.12.13	273	15½	3,986½	4·75	189·41	175	216
Samorna	..	26.2.14	5.3.14	273	14	4,397½	4·82	212·07	175	241¾
Phillipina	..	24.5.14	31.5.14	273	8½	6,628½	5·04	333·88	200	380½
Atlanta	..	25.5.14	1.6.14	‡248	18½	5,471	4·73	259·05	250	295¼
Cameo	..	28.5.14	4.6.14	273	15½	5,235	5·14	269·40	200	307
Connecticut	..	2.6.14	9.6.14	254	4½	6,730	4·74	319·05	250	363¾
Turka	..	3.6.14	10.6.14	273	7½	6,214	4·93	306·71	250	349¾
Alpina	..	5.6.14	12.6.14	273	14	6,816	3·95	269·04	200	306¾
Asiana	..	19.6.14	26.6.14	273	5½	5,800	4·91	285·04	250	325
Vuelta	..	19.6.14	26.6.14	233	4	7,401½	4·46	330·20	250	376½
Sumatra	..	21.6.14	28.6.14	273	9½	8,990	4·67	419·81	250	478½
Netherlana	..	23.6.14	30.6.14	273	18	6,612½	4·21	278·23	200	317¼
Pennsylvania ..	..	28.6.14	5.7.14	273	28	9,439½	4·07	384·71	250	438½
Cuba	..	12.7.14	19.7.14	273	22	9,526	4·47	426·33	250	486
Virginia	..	14.7.14	21.7.14	273	22	9,202	4·41	405·77	250	462½
Tennessee	..	15.7.14	22.7.14	273	17½	6,226½	4·06	252·93	175	288¼
La Reina	..	16.7.14	23.7.14	273	13½	4,318	5·05	218·07	175	248½
Sylvia	..	19.7.14	26.7.14	273	12½	4,701½	4·70	221·23	175	252¼
Mexicana	..	24.7.14	31.7.14	273	8	8,465	4·63	391·64	250	446½
Muria	..	25.7.14	1.8.14	273	30	12,297½	5·74	705·88	250	804¾
Bullion	..	28.7.14	4.8.14	273	20	10,090½	4·23	426·71	250	486½
Piplo	..	29.7.14	5.8.14	273	17	6,045½	4·68	282·86	175	322½
Goldleaf	..	4.8.14	11.8.14	273	15½	7,754½	4·43	343·82	250	392
Europa	..	5.8.14	12.8.14	273	18½	7,753½	4·34	336·65	250	383¾
Persica	..	7.8.14	14.8.14	273	21½	8,287	4·85	402·25	250	458½
Havana	..	18.8.14	25.8.14	273	12	†6,543	4·02	263·34	250	300¼
Birdseye	..	30.8.14	6.9.14	273	12½	7,942½	5·51	437·56	250	498¾
Egypta	..	31.8.14	7.9.14	273	15½	9,603	3·91	375·32	250	427¾
Mongolia	..	20.9.14	27.9.14	273	15½	5,524	4·18	231·23	175	263½

* Sickness for seven days affected yield.

† Protracted lameness during term affected yield.

‡ Sold twenty-five days before expiration of term.

GEELONG HARBOR TRUST, Marshalltown. (AYRSHIRE.)

Completed during the year—20. Certificated—8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Sylvia of Glen Elgin ..	1845	5.10.13	12.10.13	273	12¼	*8,273¼	3·84	318·00	250	362¼
Daphne of Sparrovale	2873	3.11.13	10.11.13	273	7¾	4,909½	5·09	249·71	200	284¾
Gipsy Maid of Sparrovale	2510	13.1.14	20.1.14	273	7½	4,411¼	4·32	190·63	175	217¼
Sweet Flower of Glen Elgin	1844	5.3.14	12.3.14	220	4	5,681	4·61	261·71	250	298¼
Ruby of Sparrovale ..	2512	2.4.14	9.4.14	273	15½	5,488½	4·13	226·75	175	258½
Ada VII. of Glen Elgin	1802	6.4.14	13.4.14	273	15	6,651	4·52	300·54	250	342¼
Ruby of Glen Elgin ..	1836	14.4.14	21.4.14	273	14½	7,303	4·13	301·44	250	343¾
Gaiety of Gowrie Park	2875	1.6.14	8.6.14	273	14½	5,509	4·45	245·35	175	279¾

* Sickness for seven days affected yield.

A. W. JONES, Whittington. (JERSEY.)

Completed during the year—8. Certificated—8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Pet	3758	16.10.13	23.10.13	*219	14¾	4,171¾	5·45	227·61	200	259½
Lady Marge III. ..	3757	18.10.13	25.10.13	†269	13	5,197¼	6·42	333·66	200	380¼
Dolly	3754	18.10.13	25.10.13	‡221	16½	3,650¾	6·30	230·07	175	262¾
Blanchette III. ..	3753	21.10.13	28.10.13	273	11¾	5,373½	5·50	295·59	200	337
Lady Gray IV. ..	3755	7.2.14	14.2.14	†269	19	7,250¼	5·76	417·78	250	476½
Mora III.	...	15.6.14	22.6.14	273	14	7,264¾	6·18	448·75	250	511½
Lady Gray V. ..	3756	3.8.14	10.8.14	273	20	8,323¼	5·61	466·93	200	532¼
Blanchette III. ..	3753	2.9.14	9.9.14	273	12½	5,607	5·01	281·24	250	320½

* Lost 54 days at commencement of test.
† Lost 4 days at commencement of test.
‡ *Lost 52 days at commencement of test.*

P. E. KEAM, Heidelberg. (JERSEY.)

Completed during the year—2.—Certificated—1

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.		lbs.
Wilful Venture .	2974	31.8.14	7.9.14	273	19	7,429½	6·46	479·85	250	547

C. G. KNIGHT, Cobram. (JERSEY.)

Completed during the year—20. Certificated—18.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Tarnpirr ..	2986	29.11.13	6.12.13	273	11½	5,674	5·07	287·98	175	328¼
Gem of Tarnpirr ..	2004	17.12.13	24.12.13	*269	13	3,681½	5·65	208·08	175	237¼
Romany Lass ..	2563	25.12.13	1.1.14	273	16	4,283¾	5·62	240·82	175	274½
Miss Twylish ..	2369	24.1.14	31.1.14	†231	14½	3,881¾	6·46	250·73	200	[illegible]35¾
Mistletoe of Tarnpirr ..	2984	4.2.14	11.2.14	273	17½	5,888¼	5·01	295·09	175	336¼
Sweetheart of Tarnpirr	2987	30.3.14	6.4.14	273	14	4,653½	4·71	219·13	175	249¾
Doreen of Tarnpirr ..	2982	16.6.14	23.6.14	273	5½	‡3,548½	5·55	197·14	175	224¾
Amy Castles ..	1520	17.6.14	24.6.14	244	5	5,104	5·97	304·53	250	347¼
Lady Progress ..	2178	10.7.14	17.7.14	273	6½	4,639	5·56	258·02	250	294¼
Foxglove of Tarnpirr ..	2983	13.7.14	20.7.14	258	4	3,795½	6·75	256·20	175	292
Dolly of Tarnpirr ..	1840	14.7.14	21.7.14	273	6½	5,367	5·73	307·50	250	350¾
Bo-peep	1604	16.7.14	23.7.14	§238	4½	5,412½	4·73	256·33	175	292¼
Mythic	2404	16.7.14	23.7.14	253	4½	6,031	5·25	316·58	250	361
Primrose of Tarnpirr ..	2985	27.7.14	3.8.14	243	4	3,912	5·65	221·21	175	252¼
Bonnie	2980	8.8.14	15.8.14	273	5	4,628	5·36	248·11	175	282¾
Lily of Tarnpirr ..	2221	15.8.14	22.8.14	262	4	4,568	4·38	200·33	200	228¼
Tit Bits of Tarnpirr ..	2988	27.8.14	3.9.14	273	11½	5,415½	4·95	268·26	175	305¾
Royal Rose	2585	21.9.14	28.9.14	273	8	5,548	5·61	311·34	250	355

* Sold 4 days before expiration of term.
† Sold 42 days before expiration of term.
‡ An attack of hoven affected yield.
§ Lost first 4 days, as weights not kept.

C. D. LLOYD, Caulfield. (JERSEY.)

Completed during the year—6. Certificated—6.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Queen Spark ..	2533	12.11.13	19.11.13	*237	15½	4,194¼	7·04	295·24	200	336½
Countess Twylish ..	928	15.11.13	22.11.13	273	22	8,505½	5·11	435·13	250	496
Doreen	2976	18.3.14	25.3.14	273	13½	4,952½	5·38	266·26	175	303½
Sparkle	2978	25.4.14	2.5.14	273	15	5,672¾	6·32	358·85	175	409
Bluebell	2975	28.6.14	4.7.14	273	14½	4,781	6·16	294·45	175	335¾
Sweet Bread XXIV. (Imp.)	2979	16.8.14	23.8.14	273	17	8,504½	5·67	482·26	250	549¾

* Lost 36 days, as weights not available

C. G. LYON, Heidelberg. (JERSEY.)

Completed during the year—15. Certificated—15.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
...deen II.	1104	17.10.13	24.10.13	273	15	7,155½	4·43	317·11	250	361½
...ie II.	1136	29.11.13	6.12.13	273	28½	9,385¼	4·79	450·45	250	513½
...s Lassie of Banyule	1026	30.11.13	7.12.13	273	21	6,673½	4·95	330·78	200	377
...rmine V. ..	1386	27.12.13	3.1.14	273	28½	5,515¾	5·12	282·40	250	322
...r Pride	1387	29.12.13	5.1.14	273	18½	*6,097½	4·70	286·53	200	326¾
...r Audrey ..	1378	30.12.13	6.1.14	273	15½	6,128½	4·98	305·38	200	348
...rmine III. ..	715	9.1.14	16.1.14	273	26½	8,266¾	5·16	426·31	250	486
...thorn of Banyule	1064	4.3.14	11.3.14	273	21	7,585½	5·16	391·55	250	446½
...thorn II. of Banyule	3619	6.3.14	13.3.14	273	9	4,205¾	5·35	225·16	175	256¾
...en	636	4.8.14	11.8.14	273	11½	9,896	4·77	471·68	250	537¾
...skeet	3625	21.7.14	†19.8.14	273	18	7,287	4·70	342·65	175	390½
...e II.	614	21.8.14	28.8.14	273	15	8,043	5·03	404·81	250	461½
...leen III. ..	2140	7.9.14	14.9.14	273	15	6,918	5·55	383·81	250	437½
...rmine IV. ..	716	9.9.14	16.9.14	273	18	7,364	5·37	395·43	250	450¾
...ey Lassie ..	825	22.9.14	29.9.14	273	15	7,657	5·04	386·27	250	440¼

* Sickness for 7 days affected yield.

† Entry deferred 22 days.

W. McGARVIE, Pomborneit. (JERSEY.)

Completed during the year—4. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
.. ..	3711	26.9.13	3.10.13	273	14	4,608¾	4·29	197·67	175	225¼
.. ..	1584	27.9.13	4.10.13	273	17¼	6,128¾	4·43	271·39	200	309½
...ngs	3713	10.10.13	17.10.13	273	10	4,316¾	4·61	199·21	175	227

W. T. MANIFOLD, Camperdown. (SHORTHORN.)

Completed during the year—2. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
...wer	Not yet allotted	25.9.13	2.10.13	*268½	12¼	8,671¼	4·09	354·98	250	404¾

J. D. READ, Springhurst. (JERSEY.)

Completed during the year—21. Certificated—17.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Grannie of Springhurst	2059	5.10.13	12.10.13	259	5½	*5,612¼	6·11	342·81	250	390¾
Snowdrop of Springhurst	3709	8.4.14	15.4.14	273	9½	3,613¾	5·25	189·68	175	216¼
Princess of Springhurst	2521	16.4.14	23.4.14	273	7½	*6,291	5·87	369·11	250	420
Graceful Magnet of Springhurst ..	2058	22.4.14	29.4.14	273	16	6,506¼	5·21	338·98	250	386½
Tulip of Springhurst ..	2730	23.5.14	30.5.14	273	8	6,099	5·93	361·57	250	412¼
Stockings of Springhurst	2663	25.5.14	1.6.14	273	7½	*6,119½	4·99	305·75	250	348½
Euroa of Springhurst	1918	16.6.14	23.6.14	256	6	5,743	5·64	323·69	250	369
Phlox	Not yet allotted	20.7.14	27.7.14	268	6½	4,027	5·35	215·48	175	245¾
Buttercup of Springhurst	3702	3.8.14	10.8.14	257	4½	4,435	6·04	267·80	200	305¼
Foxglove of Springhurst	3704	5.8.14	12.8.14	273	5	4,653½	5·39	251·06	200	286¼
Iris of Springhurst ..	3706	7.8.14	14.8.14	273	4	*3,708½	5·98	221·69	200	252¾
Dulcie of Springhurst	*1878*	*9.8.14*	*16.8.14*	*273*	*5½*	*5,014½*	*5·60*	*281·10*	*250*	*320½*
Hyacinth	3705	12.8.14	19.8.14	245	7	3,245	5·99	194·40	175	221½
Cowslip	3703	17.8.14	24.8.14	273	10½	5,131½	4·92	252·67	250	288
Shamrock of Spring*hurst*	*3708*	*17.8.14*	24.8.14	*267*	*5½*	3,807	*5·37*	204·30	175	233
Lupin	Not yet allotted	16.9.14	23.9.14	273	12	4,262½	5·06	215·54	175	245¾
Nightshade ..	3707	17.9.14	24.9.14	273	9	5,049	4·55	229·60	200	261¾

* An attack of mammitis affected yield.

MISS S. L. ROBINSON, Malvern. (JERSEY.)

Completed during the year—7. Certificated—3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	bs.	lbs.
Lotina (Imp.) ..	*1160*	26.10.13	2.11.13	273	15	8,200	5·20	426·63	250	486
White Belle (Imp.) ..	1488	2.11.13	9.11.13	273	22¼	9,044	5·09	460·73	250	525¼
Defenders Claribelle ..	958	7.6.14	14.6.14	273	5½	5,660¼	5·70	322·80	250	368¼

D. SADLER, Camperdown. (AYRSHIRE.)

Completed during the year—8. Certificated—8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Flirt of Kilmarnock ..	3091	1.10.13	8.10.13	273	7	*7,989¼	3·8230	6·34	200	349¼
Annie of Kilmarnock	3089	21.12.13	28.12.13	268	7½	7,277¼	4·4232	1·42	250	366½
Almie of Kilmarnock	3088	16.3.14	23.3.14	273	11	*3,498¼	5·3318	6·62	175	212¾
Pearl of Kilmarnock	3098	*2.5.14*	*9.5.14*	*273*	*10*	*4,951¼*	*4·5922*	*7·51*	*175*	*259¼*
Sunflower of Kilmarnock	3100	13.5.14	20.5.14	273	5	5,479	4·8426	5·42	175	302¼
Get of Kilmarnock ..	3092	16.5.14	23.5.14	273	17	6,643	4·1227	3·49	175	311¾
Brilliant of Kilmarnock	3090	17.5.14	24.5.14	273	4	5,338¼	4·6824	9·75	175	284¾
Spider of Kilmarnock	3099	21.5.14	28.5.14	273	5	3,924¾	4·5817	9·76	175	205

* Sickness affected yield.

SADLER BROS., Noorat. (AYRSHIRE.)

Completed during the year—9. Certificated—4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lenore of Ecclefechan	2692	20.3.14	27.3.14	273	12½	5,721¾	4·11	235·46	175	267¼
Gladys of Burnbrae ..	3080	26.3.14	2.4.14	273	4	7,473	3·91	292·31	250	333¼
Ruby of Burnbrae ..	3085	29.4.14	6.5.14	231	4	6,169½	4·11	253·42	250	289
Lady of Ecclefechan	2308	10.8.14	17.8.14	273	5½	6,610½	4·51	267·83	250	305¼

F. J. STANSMORE, Pomborneit. (AYRSHIRE.)

Completed during the year—58. Certificated—4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gladness II. of Caulfield	3164	16.10.13	23.10.13	214	7	6,065¾	4·62	280·58	250	319¾
Glad	3163	5.1.14	12.1.14	273	9¼	4,035	4·39	177·22	175	202
Ida of Yalart ..	2717	5.1.14	12.1.14	273	17	5,937¾	4·97	295·20	250	336½
Esme of Inverkeil ..	3155	27.2.14	6.3.14	273	15	5,799¼	4·18	242·51	200	276½

E. N. WOOD, Caulfield. (JERSEY.)

Completed during the year—1. Certificated—1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Luxury II. ..	3726	2.8.14	*24.8.14	273	14¼	5,629	5·83	328·49	200	374¼

W. WOODMASON, Malvern. (JERSEY.)

Completed during the year—64. Certificated—61.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Laura VII. of Melrose	3659	25.9.13	2.10.13	273	22	8,101½	5·33	432·16	250	492¾
Carrie V. of Melrose	3634	8.9.13	*6.10.13	273	17	6,109	6·92	422·84	250	482
Waverley Lass ..	2793	30.9.13	7.10.13	273	26	7,588¾	5·31	402·74	250	459
Chevy VII. of Melrose	3636	2.10.13	9.10.13	273	12½	4,816¾	5·97	287·63	175	328
Daisy V. of Melrose ..	3637	2.10.13	9.10.13	273	13	4,060	5·47	219·33	175	250
Jenny Lind VIII. of Melrose	3651	2.10.13	9.10.13	273	15	5,639	5·78	326·08	175	371¾
Peerless VII. of Melrose	3672	3.10.13	10.10.13	273	12½	4,683½	6·13	287·37	175	327½
Flower V. of Melrose..	*3640*	*7.10.13*	*14.10.13*	*273*	*20*	*7,678*	*5·76*	*442·32*	*250*	*504¼*
Jessie VIII. of Melrose	3653	16.10.13	23.10.13	273	15½	6,554½	6·27	410·90	250	468½
Fuchsia VIII. of Melrose	3644	17.10.13	24.10.13	273	12	4,261¾	6·29	268·23	175	305¾
Pearl II. of Melrose ..	3670	17.10.13	24.10.13	273	11½	3,924½	5·60	219·75	175	250½
Lily IV. of Melrose ..	3661	18.10.13	25.10.13	273	13½	5,026¾	5·83	293·20	175	334¼
Peerless of Melrose III.	2817	20.10.13	27.10.13	249	4½	6,318¼	5·48	346·31	250	394¾
Graceful Duchess X. of Melrose	3646	20.10.13	27.10.13	273	10	4,230½	6·68	282·85	175	322½
Quality VI. of Melrose	3674	23.10.13	30.10.13	273	22	7,158½	5·83	417·45	250	476
Handsome Girl VI. of Melrose	3648	26.10.13	2.11.13	273	12	4,234	6·63	280·56	175	319¾
Bessie VI. of Melrose	3632	1.11.13	8.11.13	273	17	5,832½	5·08	296·23	200	337¾
Rarity VI. of Melrose	*3675*	*4.11.13*	*11.11.13*	*273*	*13½*	*6,420*	*5·88*	*377·47*	*200*	430¼
Mystery XII. of Melrose	3667	12.11.13	19.11.13	273	14	4,664¾	5·77	268·97	200	306¾
Jessie IX. of Melrose	3654	22.11.13	29.11.13	273	21	6,785¾	5·59	379·75	250	433
Flower VI. of Melrose	3641	23.11.13	30.11.13	273	19	6,002½	5·77	346·18	250	394¾
Banker VI. of Melrose	3631	24.11.13	1.12.13	†264	20½	5,743½	5·80	291·90	175	332¾
Mermaid II. of Melrose	Not yet allotted	13·12·13	20·12·13	‡242½	19	4,930¼	5·53	272·83	200	311
Lassie Fowler III. of Melrose	1137	*22.12.13*	*29.12.13*	273	22	7,287¼	5·83	425·00	250	484½
Laura VIII. of Melrose	3660	31.12.13	7.1.14	273	19½	4,734¾	5·50	260·42	175	296¾
Zoe V. of Melrose ..	1496	8.1.14	15.1.14	273	19	5,284½	6·94	366·60	250	418
Rarity of Melrose V.	1344	23.1.14	30.1.14	273	21	7,200¾	5·77	415·51	250	473¾
Mystery VIII. of Melrose	3664	24.1.14	31.1.14	273	18½	5,556	6·32	351·02	250	400¼
Laura VI. of Melrose..	3658	20.2.14	27.2.14	273	20	7,667¼	5·68	435·78	250	496¾
Jenny Lind of Melrose VI.	3649	4.3.14	11.3.14	§268	17½	7,081½	5·03	356·39	250	406¼
Jessie of Melrose XIV.	Not yet allotted	16.3.14	23.3.14	273	13	4,141¼	5·51	228·34	175	260¼
Lady Melrose IV. ..	,,	16.3.14	23.3.14	273	18	5,152¼	5·22	269·22	175	307
Graceful Duchess of Melrose VIII. ..	1056	11.4.14	*18.4.14*	*273*	25½	8,765	5·77	*505·72*	250	576½
Jenny Lind VII. of Melrose	3650	15.4.14	22.4.14	273	23	7,877½	5·64	444·57	250	506¾
Jessie of Melrose VI. ..	Not yet allotted	27.4.14	4.6.14	273	21½	7,924¼	6·71	532·17	250	606¾
Polly	,,	27.6.14	4.7.14	273	20½	7,446½	4·87	362·36	175	413
Empire	,,	15.7.14	22.7.14	273	15	5,661	5·42	307·08	175	350
Pleasance of Melrose IV.	1297	18.7.14	25.7.14	273	23	7,990	4·22	321·36	250	366½
Jessie of Melrose XI.	3656	20.7.14	27.7.14	273	15½	7,108½	5·92	420·61	250	479½
Lady Elector of Melrose	1114	20.7.14	27.7.14	273	6	4,706½	5·54	260·80	250	297¼
Pearl of Melrose ..	3669	22.7.14	29.7.14	273	15½	7,288	4·63	337·65	250	385
Sweet Pansy of Melrose	1413	28.7.14	4.8.14	273	13	6,172½	6·09	376·08	250	428¾
Vanilla V. of Melrose	3678	1.8.14	8.8.14	273	15½	8,680	5·07	440·18	250	501¾
Merry Girl IV. of Melrose	*3662*	12.8.14	19.8.14	273	14½	6,710¾	5·81	389·94	250	444½
Lassie Fowler ..	Not yet allotted	13.8.14	20.8.14	273	15½	5,977	5·69	340·32	175	388

* Entry deferred 3 weeks, as no weights available.
† Lost 9 days, as weights not furnished.
‡ Lost 30½ days, as weights not furnished.
§ Lost first 5 days through omission to weigh.

W. Woodmason, Malvern—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard of Fat Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Peerless VIII. of Melrose	3673	13.8.14	20.8.14	273	16½	6,619¼	5·31	351·70	200	401
Pleasance	Not yet allotted	21.8.14	28.8.14	273	13½	4,859¼	5·71	277·57	175	316¼
Carrie V. of Melrose	3634	23.8.14	30.8.14	273	14	5,646½	6·43	363·10	250	414
Empire IV. of Melrose	3639	23.8.14	30.8.14	273	26	8,534¼	5·61	479·13	250	546¼
Mates	Not yet allotted	28.8.14	4.9.14	273	13½	5,276¼	5·11	269·57	175	307¼
Lizzie	..	31.8.14	7.9.14	273	8½	4,128	5·57	229·85	175	262
Blossom of Melrose III.	3633	2.9.14	9.9.14	273	19	7,256	4·55	329·87	250	376
Handsome Girl of Melrose III.	1062	5.9.14	12.9.14	273	9½	5,878	5·18	304·58	250	347¼
Jessie of Melrose X.	3655	5.9.14	12.9.14	273	13½	6,769¼	5·72	387·50	250	441¾
Snowy III. of Melrose	3676	9.9.14	16.9.14	273	14½	6,404½	4·62	296·12	200	337½
Handsome Girl VI. of Melrose	3648	10.9.14	17.9.14	273	13	5,310	6·57	349·14	200	398
Handsome Girl of Melrose V.	3647	16.9.14	23.9.14	262	5	5,083	5·70	289·57	250	330
Peerless VI. of Melrose	3671	16.9.14	23.9.14	273	13	6,665	5·73	381·91	250	435¼
Chevy VII. of Melrose	3636	17.9.14	24.9.14	273	13	5,784	5·61	324·56	200	370
Edith of Melrose	3638	22.9.14	29.9.14	273	18	8,445	4·69	395·79	250	451¼
Pearl II. of Melrose	3670	23.9.14	30.9.14	273	14	5,767	5·67	327·13	200	373

ORDER OF MERIT.

Analysis of Herds Competing.

Breed.	Herds.	No. of Cows Completed Term.	No. of Cows Certificated.	Percentage Certificated.
Jersey	13	158	137	86·71
Ayrshire	5	126	52	41·27
Red Poll	1	36	33	91·66
Dexter-Kerry	1	3	2	66·66
Milking Shorthorns	1	2	1	50·00
Totals	21	325	225	69·23

COWS IN ORDER OF MERIT.

Cows over 4 years of Age.—250 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	*Muria*	*Not yet allotted*	*Department of Agriculture*	*Red Poll*	*12,297½*	*5·74*	*705·88*	*804¾*
2	Linda of Gowrie Park ..	2426	W. P. Brisbane ..	Ayrshire ..	13,401	4·78	640·50	730¼
3	Ida of Gowrie Park ..	2423	W. P. Brisbane ..	,, ..	11,917¼	5·08	605·05	689¾
4	*Laura IV. of Gowrie Park*	*1709*	*W. P. Brisbane* ..	,, ..	*10,764½*	*5·28*	*568·71*	*648¼*
5	Honey of Gowrie Park ..	2422	W. P. Brisbane ..	,, ..	12,655½	4·41	558·39	636½
6	Jessie of Melrose VI. ..	Not yet allotted	W. Woodmason ..	Jersey ..	7,924¼	6·71	532·17	606¾
7	*Blossom of Gowrie Park* ..	*2411*	W. P. Brisbane ..	*Ayrshire* ..	*10,601¼*	*4·94*	*523·77*	*597*
8	Trixie of Gowrie Park ..	2434	W. P. Brisbane ..	,,	10,725	4·75	509·32	580½
9	Graceful Duchess of Melrose VIII.	1056	W. Woodmason ..	Jersey ..	8,765	5·77	505·72	576½
10	Pretty of Gowrie Park ..	2797	W. P. Brisbane ..	Ayrshire ..	11,196½	4·42	494·66	564
11	Dairymaid II. of Gowrie Park	2415	W. P. Brisbane ..	,, ..	9,682	5·09	492·98	562
12	Sweet Bread XXIV. (Imp.)	2979	C. D. Lloyd ..	Jersey ..	8,504½	5·67	482·26	549¾
13	Wilful Venture	2974	P. E. Keam ..	,, ..	7,429½	6·46	479·85	547
14	Empire IV. of Melrose ..	3639	W. Woodmason ..	,, ..	8,534½	5·61	479·13	546½
15	Noreen	636	C. G. Lyon ..	,, ..	9,896	4·77	471·68	537¾
16	White Belle (Imp.) ..	1488	Miss S. L. Robinson	,, ..	9,044	5·09	460·73	525¼
17	Lassie II.	1136	C. G. Lyon ..	,, ..	9,385¼	4·79	450·45	513½
18	Mora III.	..	A. W. Jones ..	,, ..	7,264¾	6·18	448·75	511½
19	Jenny Lind VII. of Melrose	3650	W. Woodmason ..	,, ..	7,877½	5·64	444·57	506¾
20	Flower V. of Melrose ..	3640	W. Woodmason ..	,, ..	7,678	5·76	442·32	504¼
21	Vanilla V. of Melrose ..	3678	W. Woodmason ..	,, ..	8,680	5·07	440·18	501¾
22	Birdseye	Not yet allotted	Department of Agriculture	Red Poll	7,942½	5·51	437·56	498¾
23	Laura VI. of Melrose ..	3658	W. Woodmason ..	Jersey ..	7,667¼	5·68	435·78	496¾
24	Countess Twylish ..	928	C. D. Lloyd ..	,, ..	8,505½	5·11	435·13	496
25	Laura IV. of Gowrie Park ..	1709	W. P. Brisbane ..	Ayrshire ..	9,291¼	4·67	434·13	495
26	*Laura VII. of Melrose* ..	*3659*	*W. Woodmason* ..	*Jersey* ..	*8,101¼*	*5·33*	*432·16*	*492¾*
27	Bullion	Not yet allotted	Department of Agriculture	Red Poll	10,090½	4·23	426·71	486½
28	Lotina (Imp.)	1160	Miss S. L. Robinson	Jersey ..	8,200	5·20	426·63	486¼
29	*Cuba*	*Not yet allotted*	*Department of Agriculture*	*Red Poll*	*9,526*	*4·47*	*426·33*	*486*
30	Silvermine III.	715	C. G. Lyon ..	Jersey ..	8,266¼	5·16	426·31	486
31	Lassie Fowler III. of Melrose	1137	W. Woodmason ..	,, ..	7,287¼	5·83	425·00	484½
32	Carrie V. of Melrose ..	3634	W. Woodmason ..	,, ..	6,109	6·92	422·84	482
33	Jessie of Melrose XI. ..	3656	W. Woodmason ..	,, ..	7,108½	5·92	420·61	479½
34	Lucie of Glen Elgin ..	2109	W. P. Brisbane ..	Ayrshire ..	8,334	5·04	420·19	479
35	Sumatra	Not yet allotted	Department of Agriculture	Red Poll	8,990	4·67	419·81	478½
36	Lady Grey IV.	3755	A. W. Jones ..	Jersey ..	7,250¼	5·76	417·78	476¼
37	Quality VI. of Melrose ..	3674	W. Woodmason ..	,, ..	7,158½	5·83	417·45	476
38	Princess of Gowrie Park ..	1710	W. P. Brisbane ..	Ayrshire	8,930¾	4·67	416·78	475¼
39	Rarity of Melrose V. ..	1344	W. Woodmason ..	Jersey ..	7,200¾	5·77	415·51	473¾
40	Jessie VIII. of Melrose ..	3653	W. Woodmason ..	,, ..	6,554½	6·27	410·90	468½
41	Virginia	Not yet allotted	Department of Agriculture	Red Poll	9,202	4·41	405·77	462½
42	Molly II.	614	C. G. Lyon ..	Jersey ..	8,043	5·03	404·81	461½
43	Waverley Lass	2793	W. Woodmason ..	,, ..	7,588¾	5·31	402·74	459
44	Persica	Not yet allotted	Department of Agriculture	Red Poll	8,287	4·85	402·25	458½
45	Dolly Varden of Gowrie Park	2418	W. P. Brisbane ..	Ayrshire ..	9,027	4·41	398·28	454
46	Edith of Melrose ..	*3638*	W. *Woodmason* ..	*Jersey* ..	*8,445*	*4·69*	*395·79*	*451¼*
47	Silvermine IV.	716	C. G. Lyon ..	,, ..	7,364	5·37	395·43	450¾
48	Mexicana	Not yet allotted	Department of Agriculture	Red Poll	8,465	4·63	391·64	446½
49	*Hawthorn of Banyule* ..	*1064*	*C. G. Lyon* ..	Jersey ..	7,585½	3·16	391·55	446½
50	Merry Girl IV. of Melrose ..	3662	W. Woodmason ..	,, ..	6,710¾	5·81	389·94	444½
51	Jessie of Melrose X. ..	3655	W. Woodmason ..	,, ..	6,769½	5·72	387·50	441¾
52	Audrey Lassie	825	C. G. Lyon ..	,, ..	7,657	5·04	386·27	440½
53	Pennsylvania	Not yet allotted	Department of Agriculture	Red Poll	9,439½	4·07	384·71	438½
54	Kathleen III.	2140	C. G. Lyon ..	Jersey ..	6,918	5·55	383·81	437½
55	Patch of Gowrie Park ..	2430	W. P. Brisbane ..	Ayrshire ..	7,757¾	4·93	382·66	436½
56	Peerless VI. of Melrose ..	3671	W. Woodmason ..	Jersey ..	6,665	5·73	381·91	435½
57	Jessie IX. of Melrose ..	3654	W. Woodmason ..	,,	6,785¾	5·59	379·75	433
58	Chaffinch of Gowrie Park ..	2413	W. P. Brisbane ..	Ayrshire ..	7,582	5·00	378·83	431¾
59	Sweet Pansy of Melrose ..	1413	W. Woodmason ..	Jersey ..	6,172½	6·09	376·08	428¾
60	Egypta	Not yet allotted	Department of Agriculture	Red Poll	9,603	3·91	375·32	427¾

COWS OVER 4 YEARS OF AGE—250 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
61	Heather Duchess of Gowrie Park	1449	W. P. Brisbane	Ayrshire	7,557	4·94	373·47	425¾
62	Princess of Springhurst	2521	J. D. Read	Jersey	6,291	5·87	369·11	420¾
63	Zoe V. of Melrose	1496	W. Woodmason	"	5,284½	6·94	366·60	418
64	Carrie V. of Melrose	3634	W. Woodmason	"	5,646½	6·43	363·10	414
65	Tulip of Springhurst	2730	J. D. Read	"	6,099	5·93	361·57	412¼
66	Jenny Lind VI. of Melrose	3649	W. Woodmason	"	7,081¼	5·03	356·39	406¼
67	Sunflower	Not yet allotted	W. T. Manifold	Shorthorn	8,671½	4·09	354·98	404¾
68	Mystery VIII. of Melrose	3664	W. Woodmason	Jersey	5,556	6·32	351·02	400¼
69	Larkspur's Claribelle VI.	3772	A. Box	"	7,088½	4·94	350·14	399¼
70	Peerless of Melrose III.	2817	W. Woodmason	"	6,318¼	5·48	346·31	394¾
71	Flower VI. of Melrose	3641	W. Woodmason	"	6,002¼	5·77	346·18	394¾
72	Goldleaf	Not yet allotted	Department of Agriculture	Red Poll	7,754½	4·43	343·82	392
73	Grannie of Springhurst	2059	J. D. Read	Jersey	5,612¼	6·11	342·81	390¾
74	Graceful Magnet of Springhurst	2058	J. D. Read	"	6,506¼	5·21	338·98	386½
75	Pearl of Melrose	3669	W. Woodmason	"	7,288	4·63	337·65	385
76	Europa	Not yet allotted	Department of Agriculture	Red Poll	7,753½	4·34	336·65	383¾
77	Vuelta	"	Department of Agriculture	Red Poll	7,401½	4·46	330·20	376½
78	Blossom of Melrose III.	3633	W. Woodmason	Jersey	7,256	4·55	329·87	376
79	Euroa of Springhurst	1918	J. D. Read	"	5,743	5·64	323·69	369
80	Defender's Claribelle	958	Miss S. L. Robinson	"	5,660¼	5·70	322·80	368
81	Annie of Kilmarnock	3089	D. Sadler	Ayrshire	7,277½	4·42	321·42	366½
82	Pleasance of Melrose IV.	1297	W. Woodmason	Jersey	7,990	4·22	321·36	366¼
83	Connecticut	Not yet allotted	Department of Agriculture	Red Poll	6,730	4·74	319·05	363¾
84	Sylvia of Glen Elgin	1845	Geelong Harbour Trust	Ayrshire	8,273¼	3·84	318·00	362½
85	Kathleen II.	1104	C. G. Lyon	Jersey	7,155¼	4·43	317·11	361½
86	Mythic	2404	C. G. Knight	"	6,031	5·25	316·58	361
87	Royal Rose	2585	C. G. Knight	"	5,548	5·61	311·34	355
88	Kentucky	Not yet allotted	Department of Agriculture	Red Poll	7,804½	3·96	309·02	352¼
89	Dolly of Tarnpirr	1840	C. G. Knight	Jersey	5,367	5·73	307·50	350½
90	Turka	Not yet allotted	Department of Agriculture	Red Poll	6,214	4·93	306·71	349¾
91	Flirt of Kilmarnock	3091	D. Sadler	Ayrshire	7,989¼	3·82	306·34	349¼
92	Stockings of Springhurst	2663	J. D. Read	Jersey	6,119½	4·99	305·75	348½
93	Handsome Girl of Melrose III.	1062	W. Woodmason	"	5,878	5·18	304·58	347¼
94	Amy Castles	1520	C. G. Knight	"	5,104	5·97	304·53	347¼
95	Ruby of Glen Elgin	1836	Geelong Harbour Trust	Ayrshire	7,303	4·13	301·44	343¾
96	Ada VII. of Glen Elgin	1802	Geelong Harbour Trust	"	6,651	4·52	300·54	342½
97	Ida of Yalart	2717	F. J. Stansmore	"	5,937¾	4·97	295·20	336½
98	Gladys of Burnbrae	3080	Sadler Bros.	"	7,473	3·91	292·31	333¼
99	Handsome Girl V. of Melrose	3647	W. Woodmason	Jersey	5,083	5·70	289·57	330
100	Asiana	Not yet allotted	Department of Agriculture	Red Poll	5,800	4·91	285·04	325
101	Silvermine V.	1386	C. G. Lyon	Jersey	5,515¾	5·12	282·40	322
102	Blanchette III.	3753	A. W. Jones	"	5,607	5·01	281·24	320½
103	Dulcie of Springhurst	1878	J. D. Read	"	5,014½	5·60	281·10	320½
104	Gladness II. of Caulfield	3164	F. G. Stansmore	Ayrshire	6,065¾	4·62	280·58	319¾
105	Egypta	Not yet allotted	Department of Agriculture	Red Poll	6,682	4·13	275·80	314½
106	Lady of Ecclefechan	2308	Sadler Bros.	Ayrshire	6,610½	4·51	267·83	305¼
107	Havana	Not yet allotted	Department of Agriculture	Red Poll	6,543	4·02	263·34	300¼
108	Sweet Flower of Glen Elgin	1844	Geelong Harbour Trust	Ayrshire	5,681	4·61	261·71	298¼
109	Killow	Not yet allotted	Mrs. B. M. Beckwith	Dexter Kerry	5,658¼	4·62	261·64	298¼
110	Lady Elector of Melrose	1114	W. Woodmason	Jersey	4,706½	5·54	260·80	297¼
111	Songstress of Gowrie Park	2122	W. P. Brisbane	Ayrshire	5,988½	4·33	259·26	295½
112	Atlanta	Not yet allotted	Department of Agriculture	Red Poll	5,471	4·73	259·05	295¼
113	Lady Progress	2178	C. G. Knight	Jersey	4,639	5·56	258·02	294¼
114	Ruby of Burnbrae	3085	Sadler Bros.	Ayrshire	6,169½	4·11	253·42	289
115	Cowslip	3703	J. D. Read	Jersey	5,131½	4·92	252·67	288

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Moonlight of Gowrie Park	2796	W. P. Brisbane ..	Ayrshire	10,079	4·95	499·26	569½
2	*Diamond of Gowrie Park* ..	2791	W. P. Brisbane ..	,, ..	9,627½	5·06	487·44	555¾
3	Lady Grey V.	3756	A. W. Jones ..	Jersey ..	8,323¼	5·61	466·93	532¼
4	Rarity VI. of Melrose ..	3675	W. Woodmason ..	,, ..	6,420	5·88	377·47	430½
5	Peerless VIII. of Melrose ..	3673	W. Woodmason ..	,, ..	6,619½	5·31	351·70	401
6	Handsome Girl VI. of Melrose	3648	W. Woodmason ..	,, ..	5,310	6·57	349·14	398
7	Phillipina	Not yet allotted	Department of Agriculture	Red Poll	6,628½	5·04	333·88	380½
8	*Lady Marge III.* ..	*3757*	*A. W. Jones* ..	*Jersey* ..	5,197½	6·42	333·66	380¼
9	Fox's Lassie of Banyule ..	1026	C. G. Lyon ..	,, ..	6,673½	4·95	330·78	377
10	*Luxury II.*	*3726*	*E. N. Wood* ..	,, ..	5,629	5·83	328·49	374½
11	Pearl II. of Melrose ..	3670	W. Woodmason ..	,, ..	5,767	5·67	327·13	373
12	Chevy VII. of Melrose ..	3636	W. Woodmason ..	,, ..	5,784	5·61	324·56	370
13	Goldleaf	Not yet allotted	Department of Agriculture	Red Poll	6,895	4·49	309·50	352¾
14	Silver Audrey	1378	C. G. Lyon ..	Jersey ..	6,128½	4·98	305·38	348
15	Bessie VI. of Melrose ..	3632	W. Woodmason ..	,, ..	5,832½	5·08	296·23	337¾
16	Snowy III. of Melrose ..	3676	W. Woodmason ..	,, ..	6,404½	4·62	296·12	337½
17	Blanchette III.	3753	A. W. Jones ..	,, ..	5,373¼	5·50	295·59	337
18	*Queen Spark*	*2533*	*C. D. Lloyd* ..	,, ..	4,194¼	7·04	295·24	336½
19	Silver Pride	1387	C. G. Lyon ..	,, ..	6,097½	4·70	286·53	326¾
20	Roseneath Daphne ..	3774	A. Box	,, ..	5,457½	5·16	281·53	321
21	Netherlana	Not yet allotted	Department of Agriculture	Red Poll ..	6,612½	4·21	278·23	317¼
22	Mermaid II. of Melrose ..	,,	W. Woodmason ..	Jersey ..	4,930¼	5·53	272·83	311
23	Bessie	1584	W. McGarvie ..	,, ..	6,128¾	4·43	271·39	309½
24	Ardath	*Not yet allotted*	Department of Agri-*culture*	Red Poll ..	5,640	4·80	270·64	308½
25	Cameo	,,	Department of Agriculture	,, ..	5,235	5·14	269·40	307
26	Alpina	,,	Department of Agriculture	,, ..	6,816	*3·95*	*269·04*	*306¾*
27	Mystery XII. of Melrose ..	3667	W. Woodmason ..	Jersey ..	4,664¾	5·77	268·97	306¾
28	Buttercup of Springhurst ..	3702	J. D. Read ..	,, ..	4,435	6·04	267·80	305¼
29	Foxglove of Springhurst ..	3704	J. D. Read ..	,, ..	4,653½	5·39	251·06	286¼
30	Miss Twylish	2369	C. G. Knight ..	,, ..	3,881¾	6·46	250·73	285¾
31	Daphne of Sparrovale ..	2873	Geelong Harbour Trust	Ayrshire ..	4,909½	5·09	249·71	284¾
32	*Esme of Inverkeil* ..	*3155*	*F. J. Stansmore* ..	,, ..	*5,799¼*	*4·18*	*242·51*	*276¼*
33	Nightshade	3707	J. D. Read ..	Jersey ..	5,049	4·55	229·60	261¾
34	Pet	3758	A. W. Jones ..	,, ..	4,171¾	5·45	227·61	259½
35	Iris of Springhurst ..	3706	J. D. Read ..	,, ..	3,708½	5·98	221·69	252¾
36	Trilby of Gowrie Park ..	2124	W. P. Brisbane ..	Ayrsh re ..	5,130¾	4·23	216·86	247¼
37	Colleen	Not yet allotted	Mrs. B. M. Beckwith	Dexter Kerry	4,463¼	4·78	213·51	243½
38	Lily of Tarnpirr	2221	C. G. Knight ..	Jersey ..	4,568	4·38	200·33	228¼

Heifers—175 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Stella of Gowrie Park ..	2801	W. P. Brisbane ..	Ayrshire	9,398	4·75	446·42	509
2	Ivoline of Gowrie Park ..	2793	W. P. Brisbane ..	,, ..	8,564	4·84	414·78	472¾
3	Polly	Not yet allotted	W. Woodmason ..	Jersey ..	7,446½	4·87	362·36	413
4	Linnett of Gowrie Park ..	2794	W. P. Brisbane ..	Ayrshire ..	7,783	4·61	359·09	409¼
5	*Sparkle*	*2978*	*C. D. Lloyd* ..	*Jersey* ..	*5,672¾*	*6·32*	358·85	409
6	Parrakeet	3625	C. G. Lyon ..	,, ..	7,287	4·70	342·65	390½
7	Lassie Fowler	Not yet allotted	W. Woodmason ..	,, ..	5,977	5·69	340·32	388
8	Queen Bee of Gowrie Park ..	2798	W. P. Brisbane ..	Ayrshire ..	6,800	4·85	330·04	376¼
9	Jenny Lind VIII. ..	3651	W. Woodmason ..	Jersey ..	5,639	5·78	326·08	371¾
10	Peerless Pearl	3771	F. Curnick ..	,, ..	6·000	5·34	320·71	365½
11	Martha of Gowrie Park ..	2795	W. P. Brisbane ..	Ayrshire ..	6,529	4·88	318·39	363
12	Ruby Queen *of Gowrie Park*	*2800*	*W. P. Brisbane* ..	,, ..	7,174¾	4·37	313·64	357½
13	Empire	Not yet allotted	W. Woodmason ..	Jersey ..	5,661	5·42	307·08	350
14	Mistletoe of Tarnpirr ..	2984	C. G. Knight ..	,, ..	5,888¼	*5·01*	*295·09*	*336½*

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
15	Blue Bell of Pine Hill ..	2975	C. D. Lloyd ..	Jersey ..	4,781	6·16	294·45	335¾
16	Tulip of Gowrie Park ..	2435	W. P. Brisbane ..	Ayrshire ..	6,588½	4·47	294·26	335½
17	Lily IV. of Melrose ..	3661	W. Woodmason ..	Jersey ..	5,026¾	5·83	293·20	334¼
18	Banker VI. of Melrose ..	3631	W. Woodmason ..	" ..	5,743½	5·08	291·90	332¾
19	Princess of Tarnpirr ..	2986	C. G. Knight ..	" ..	5,674	5·07	287·98	328¼
20	Chevy VII. of Melrose ..	3636	W. Woodmason ..	" ..	4,816¾	5·97	287·63	328
21	Peerless VII. of Melrose ..	3672	W. Woodmason ..	" ..	4,683½	6·13	287·37	327½
22	Pipio	Not yet allotted	Department of Agriculture	Red Poll ..	6,045½	4·68	282·86	322½
23	Graceful Duchess X. of Melrose	3646	W. Woodmason ..	Jersey ..	4,230½	6·68	282·85	322½
24	Handsome Girl VI. of Melrose	3648	W. Woodmason ..	" ..	4,234	6·63	280·56	319¾
25	Pleasance	Not yet allotted	W. Woodmason ..	" ..	4,859¼	5·71	277·57	316½
26	Get of Kilmarnock ..	3092	D. Sadler ..	Ayrshire ..	6,643	4·12	273.49	311¾
27	Mates	Not yet allotted	W. Woodmason ..	Jersey ..	5,276¾	5·11	269·57	307¼
28	Lady Melrose IV. ..	Not yet allotted	W. Woodmason ..	" ..	5,152¼	5.22	269·22	307
29	Tit Bits of Tarnpirr ..	2988	C. G. Knight ..	" ..	5,415½	4·95	268·26	305¾
30	Fuchsia VIII. of Melrose ..	3644	W. Woodmason ..	" ..	4,261¾	6·29	268·23	305¾
31	Doreen	2976	C. D. Lloyd ..	" ..	4,952½	5·38	266·26	303½
32	Sunflower of Kilmarnock ..	3100	D. Sadler ..	Ayrshire ..	5,479	4·84	265·42	302½
33	Laura VIII. of Melrose ..	3660	W. Woodmason ..	Jersey ..	4,734¾	5·50	260·42	296¾
34	Lady Jean of Gowrie Park	2425	W. P. Brisbane ..	Ayrshire ..	5,418½	4·75	257·50	293½
35	Bo-peep	1604	C. G. Knight ..	Jersey ..	5,412¾	4·73	256·33	292¼
36	Foxglove of Tarnpirr ..	2983	C. G. Knight ..	" ..	3,795½	6·75	256·20	292
37	Tennessee	Not yet allotted	Department of Agriculture	Red Polls	6,226½	4·06	252·93	288¼
38	Brilliant of Kilmarnock ..	3090	D. Sadler ..	Ayrshire ..	5,338¼	4·68	249·75	284¾
39	Bonne	2980	C. G. Knight ..	Jersey ..	4,628	5·36	248·11	282¾
40	Gaiety of Gowrie Park ..	2875	Geelong Harbour Trust	Ayrshire ..	5,509	4·45	245·35	279¾
41	Romany Lass	2563	C. G. Knight ..	Jersey ..	4,283¾	5·62	240·82	274½
42	Lenore of Ecclefechan ..	2692	Sadler Bros. ..	Ayrshire ..	5,721¾	4·11	235·46	267¼
43	Mongolia	Not yet allotted	Department of Agriculture	Red Poll ..	5,524	4·18	231·23	263½
44	Dolly	3754	A. W. Jones ..	Jersey ..	3,650¾	6·30	230·07	262¼
45	Lizzie	Not yet allotted	W. Woodmason ..	" ..	4,128	5·57	229·85	262
46	Jessie of Melrose XIV. ..	Not yet allotted	W. Woodmason ..	" ..	4,141¼	5·51	228·34	260¼
47	Pearl of Kilmarnock ..	3098	D. Sadler ..	Ayrshire ..	4,951¼	4·59	227·51	259¼
48	Ruby of Sparrovale ..	2512	Geelong Harbour Trust	" ..	5,488¼	4·13	226·75	258½
49	Hawthorn II. of Banyule ..	3619	C. G. Lyon ..	Jersey ..	4,205¾	5·35	225·16	256¾
50	Sylvia	Not yet allotted	Department of Agriculture	Red Poll ..	4,701½	4·70	221·23	252¼
51	Primrose of Tarnpirr ..	2985	C. G. Knight ..	Jersey ..	3,912	5·65	221·21	252¼
52	Roseneath's Favourite IV.	Not yet allotted	A. Box ..	" ..	5,145½	4·30	221·15	252
53	Pearl II. of Melrose ..	3670	W. Woodmason ..	" ..	3,924½	5·60	219·75	250½
54	Daisy V. of Melrose ..	3637	W. Woodmason ..	" ..	4,060	5·47	219·33	250
55	Sweetheart of Tarnpirr ..	2987	C. G. Knight ..	" ..	4,653½	4·71	219·13	249¾
56	La Reina	Not yet allotted	Department of Agriculture	Red Poll ..	4,318	5·05	218·07	248½
57	Lupin	"	J. D. Read ..	Jersey ..	4,262½	5·06	215·54	245¾
58	Phlox	"	J. D. Read ..	" ..	4,027	5·35	215·48	245¾
59	Samorna	"	Department of Agriculture	Red Poll ..	4,397½	4·82	212·07	241¾
60	Gem of Tarnpirr ..	2004	C. G. Knight ..	Jersey ..	3,681¼	5·65	208·08	237¼
61	Shamrock of Springhurst ..	3708	J. D. Read ..	" ..	3,807	5·37	204·30	233
62	Stockings	3713	W. McGarvie ..	" ..	4,316¾	4·61	199·21	227
63	Daisy	3711	W. McGarvie ..	" ..	4,608¾	4·29	197·67	225¼
64	Doreen of Tarnpirr ..	2982	C. G. Knight ..	" ..	3,548¼	5·55	197·14	224¾
65	Hyacinth	3705	J. D. Read ..	" ..	3,245	5·99	194·40	221½
66	Apple Pie of Gowrie Park..	2409	W. P. Brisbane ..	" ..	4,832¾	3·98	192·16	219
67	Gipsy Maid of Sparrovale	2510	Geelong Harbour Trust	Ayrshire ..	4,411¼	4·32	190·63	217¼
68	Snowdrop of Springhurst ..	3709	J. D. Read ..	Jersey ..	3,613¾	5·25	189·68	216¼
69	Tuckahoe	Not yet allotted	Department of Agriculture	Red Poll ..	3,986½	4·75	189·41	216
70	Almie of Kilmarnock ..	3088	D. Sadler ..	Ayrshire ..	3,498½	5·33	186·62	212¾
71	Spider of Kilmarnock ..	3099	D. Sadler ..	" ..	3,924¾	4·58	179·76	205
72	Glad	3163	F. J. Stansmore ..	" ..	4,035	4·39	177·22	202

REGULATIONS CONCERNING HERD TESTING FOR THE GOVERNMENT CERTIFICATION OF STANDARD COWS.

ENTRANCE.

1. The owner of any herd of pure bred dairy cattle may submit his herd for certification.

2. Only those cows registered in a recognised herd book or pure stock register will be accepted, and all such cows in the herd must be tested, with such exceptions as are set out in clauses 14, 15, and 16.

3. An annual fee of £1 per herd and 5s. per cow tested shall be paid to the Department of Agriculture on demand.

4. Any cow entered for certification and any calf the progeny of such cow may be branded in such manner as to insure identification, and all standard cows will be marked on the inside of an ear with the Government tattoo mark and an identification number.

LACTATION PERIOD.

5. Testing and recording shall occupy a period of nine calendar months, commencing one week from date of calving, excepting under such circumstances as set forth in clause 18. This period shall be recognised as the official lactation period.

RECORDING.

6. The milk from each cow entered shall be weighed separately immediately after each milking by means of tested and approved scales, and the weight recorded on a printed chart supplied for the purpose, which shall remain the property of the Department. Such scales and chart shall be available for inspection by a Government Dairy Supervisor when required.*

SUPERVISION.

7. A Government Dairy Supervisor, under the direction of the Chief Veterinary Officer, will make periodical visits for the purpose of checking records and taking samples of milk for testing. There shall be not less than nine visits during the official lactation period, and not more than thirty days shall elapse between any two visits. Additional visits may be made at any time by the Supervisor for the purpose of taking supplementary records and samples for testing as often as may be deemed advisable.

8. Every facility shall be afforded Government Officers in carrying out their duties under these Regulations, and accommodation must be provided over night when required.

9. Particulars as to date of calving, service, drying-off, hours of milking, manner of feeding, must be supplied for record purposes on request of the Dairy Supervisor. If deemed necessary in any case, the owner may be called upon to furnish a statutory declaration as to the correctness of such or any particulars.

TESTING.

10. In collecting samples for testing, the morning and evening milk will be taken; the tests will be made by the Chemist for Agriculture or his Deputy from a composite sample containing quantities of the morning and evening milk proportionate to the respective yields, and the results, unless shown to be abnormal, shall be considered as the average for the period intervening since the next previous normal test. If apparently abnormal, the results may be discarded, and further samples taken and tests made.

STANDARD COWS.

11. Standard cows under these Regulations shall be those which, during the official lactation period, yield—

(*a*) in the case of cows commencing their first lactation period and being then under 3 years of age, 175 lbs. of butter fat;

(*b*) in the case of cows commencing their first lactation period and being then over 3 years of age, 200 lbs. of butter fat;

(*c*) in the case of cows commencing their second lactation period and being then under four years of age, 200 lbs. of butter fat;

(*d*) in the case of cows commencing their third or any subsequent lactation period or being over four years of age, 250 lbs. of butter fat.

* During the progress of "drying-off" no weight of milk under 4 lbs. per day shall be credited to any cow.

CERTIFICATION.

12. A Government Certificate shall be issued in respect of all standard cows. Such certificate shall show the breed, the age at entry, brands, the official lactation period recorded, and date of completion, the weight of milk given, the amount of butter fat and commercial butter (estimated on a 14 per cent. overrun), and the weight of milk given on the last day of the official lactation period.

13. The Certificate issued in respect of any standard cow shall, if she attain the standard during any subsequent official lactation period, be returned to the Department, when a fresh certificate will be issued, which shall show her record for each and every lactation period in which she was tested.

EXEMPTIONS.

14. Cows eight years old or over whose yields have been recorded for three official lactation periods may be exempt.

15. Aged or injured cows in the herd at time of entry, and kept for breeding purposes, may be exempt on the recommendation of the Government Supervisor. Any injury interfering with lactation received subsequent to entry may be recorded on Certificate issued.

16. Any cow which, on veterinary examination, is found to be affected with tuberculosis shall be withdrawn from the test, and her milk shall not be allowed to be used for sale, or for the preparation of any dairy produce for sale.

17. Any cow which, on veterinary examination, is found to be affected with actinomycosis of the udder, or any other disease or condition which may temporarily render her milk injurious, may remain in the herd for testing, but her milk shall not be used for sale or for the preparation of any dairy produce for sale without permission of the Supervisor.

18. When any newly-calved cow is rendered temporarily unfit for testing by being affected with milk fever, mammitis, retention of placenta, or other ailment affecting newly-calved cows, the period elapsing between the calving and entrance to the official lactation period may be extended on the recommendation of a Veterinary Officer or Supervisor, but such period shall not exceed one month from date of calving.

19. Any interpretation or decision in respect of these Regulations, or in respect of any matter concerning the Certification, which receives the written approval of the Director of Agriculture, shall be final.

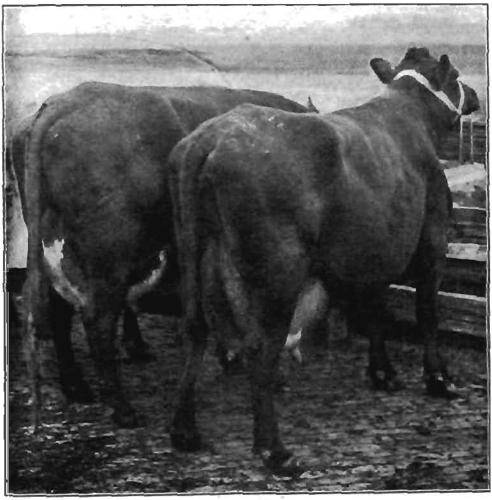
20. Should the owner of any herd entered not conform to these Regulations, such herd shall be subject to disqualification for such period as the Minister shall determine. The Minister retains the right to withdraw any Certificate when, to his satisfaction, good and sufficient cause is shown.

WORLD'S CHAMPION RED POLL—"MURIA."

The First Australian Thousand Pound Butter Cow.

By R. R. Kerr, Dairy Supervisor

If any one had predicted that the past season—the most disastrous in the history of the dairying industry of Victoria—would bring to light the first Australian cow to produce 1,000 lbs. of butter and nearly 1,500 gallons of milk, and, further, that the cow would not be a member of one of the special dairy breeds, such a prophet would have been treated with scant courtesy.



A Pair of Deep Milkers.

"Muria"—World's Champion Red Poll, on the right.

To the great majority of Victorian dairy farmers, and, for that matter, to the writer himself, the 1,000-lb. butter-cow was something of a myth, and existed only where extreme means were taken to force-feed, and give undivided attention. We have been too apt to cast

doubt upon the records made in distant lands, but it would appear that there is no reason why such envied yields should not be recorded in this State, where ideal conditions prevail, and our cattle have no long, dreary winters to contend with, such as occur in the older dairying countries of the world.

In previous years the cow Muria has always stood well forward in the Government herd of Red Polls, established by the Victorian Department of Agriculture at the Central Research Farm, Werribee. In the season 1912-1913 she was the leading cow in the herd as regards yield. Last year she was only a few pounds of butter-fat short of the leading cow, Cigarette, which latter, however, had the advantage of one month lengthier milking period. But this year she has eclipsed all previous performances in the herd, and has given the following phenomenal yield:—

Milk yield, 14,972 lbs., from July 25th, 1914, to July 25th, 1915 (365 days).
Average butter fat percentage, 5·91.
Total butter fat, 884·16 lbs.
Total commercial butter, 1,007 lbs.
Total solids in milk, 15·71 per cent.
Value of produce at the rate of 1s. per lb. of butter fat, £44 4s. 2d.

Note.—(1) The butter fat percentage is the average of twelve tests of a composite sample of morning's and evening's milk. (2) The commercial butter is calculated on an overrun of 14 per cent. only.

This yield establishes a record in at least two respects, viz.:—

1. The highest authenticated yield of both milk and butter-fat from a Red Poll cow in any part of the world, and
2. The highest authenticated or recorded yield of butter-fat from a cow of any breed in Australia.

The previous best yields that have been recorded for Red Polls in any country, and for any breed in Australia, are given alongside of those of Muria for comparison—

—	Muria's Record (1 year).	Red Poll. World's Record.	All Breeds. Australian Records.
Milk ..	14,972 lbs.	Mona, 14,713 lbs. (England)	Lily III. of Darbalara (Shorthorn), N.S.W., 12 months' yield, 17,599 lbs.
Butter fat ..	884·16 lbs.	Pear, 603·66 lbs. (Minnesota, U.S.A.)	Linda of Gowrie Park (Ayrshire), Vic., 9 months' yield, 640·5 lbs.
Butter	1,007 lbs.		Leda's Snowdrop (imp. Jersey), N.S.W., 12 months' yield, 796 lbs.

Muria's record was put up in her fifth lactation period, and although her average butter-fat test, as shown above (5.9 per cent.) is far beyond the ordinary, it is not an accidental or freak test; for though she has always been a high-testing cow, she has gradually improved in this respect each year. On her first calf her average test over the whole milking period was 4.39 per cent.; second calf, 4.75 per cent.; third calf, 5.44 per cent.; fourth calf, 5.08 per cent.; and fifth calf, 5.91 per cent.

Except in one respect, Muria had no advantage over other cows in the herd. She failed to get in calf until two months before her record

year was completed, so that for ten months her system was devoted solely to milk production, and her energies in this respect were not impaired by the demands of pregnancy. She was fed fully and well with a liberal allowance of concentrated foodstuffs added to the bulk roughage (see food table and cost below); but in other respects her treatment was in no wise different from the rest of the herd or from that of any cow in any ordinarily well-cared-for herd in the State. She ran with the other forty-odd cows throughout the year, being driven back and forward from the paddock to the milking-shed for the morning and evening milking daily with the rest. She was never housed at night, and had no protection from the weather at any time of the year, beyond the wearing of an ordinary covering at night-time during the winter months. Had she been milked four times a day, and given the other coddling and hothouse treatment that is regularly accorded to candidates for records in America, her yield might have been correspondingly increased, but her record would have been less valuable as an indication of robust and vigorous dairying capacity.

The following table setting out Muria's monthly yields should be interesting. It will be seen that her highest yield was given in August, the month following that in which she calved. During this month she yielded 1,652½ lbs. of milk, containing 97.66 lbs. of fat (5.9 per cent.). The daily average of butter for the month was 3.15 lbs., equal to 25¼ lbs. of butter per week. Her average daily yield of milk throughout the whole year was over 4 gallons (41 lbs.), and on the 365th day she gave 26 lbs. of milk.

MONTHLY YIELDS.

—	Lbs. Milk.	Days.	Test.
July 25th to Aug. 1st, 1914	274	7	—
Aug. 1st to Sept. 1st, 1914	1,652½	31	5·91
Sept. 1st to Oct. 1st, 1914	1,517	30	5·28
Oct. 1st to Nov. 1st, 1914	1,487½	31	5·44
Nov. 1st to Dec. 1st, 1914	1,424½	30	5·24
Dec. 1st to Jan. 1st, 1915	1,435½	31	5·36
Jan. 1st to Feb. 1st, 1915	1,415½	31	5·53
Feb. 1st to Mar. 1st, 1915	1,232	28	6·50
Mar. 1st to Apl. 1st, 1915 . ..	1,163½	31	6·36
Apl. 1st to May 1st, 1915	916	30	6·28
May 1st to June 1st, 1915	940½	31	7·05
June 1st to July 1st, 1915	854	30	6·46
July 1st to July 25th, 1915	659½	24	6·66
Total	14,972	365	5·91

Muria finished the year in prime condition, her live weight being 1,218 lbs. Thus her year's milk yield was 12¼ times her own weight, being over 6½ tons, and containing nearly half a ton of butter. She is a low-set cow, with a splendidly-shaped udder and well-spaced, medium-sized teats.

Food Supplied (Quantities and Cost).

As stated previously, Muria was running with the herd during the whole period, on pasture so bare as to be negligible in calculating the food cost. She was fed with the rest of the herd four times daily—twice in the bails at milking-time, and twice outside from racks, morning and evening. The food she got outside (lucerne hay and greenstuff) is recorded as the average allowance for each cow in the herd, the total amount fed having been weighed in bulk over the weighbridge. The values charged in the table are the normal values in an ordinary year, and correspondingly the value of the yield of butter has been given at the ordinary normal price of 1s. per lb. of butter-fat. It will be noted that the cost of concentrates fed (bran, &c.) is about half the total cost of the feed, and while this may appear extravagant, the net profit shown by the yield over the cost is convincing proof of the wisdom of feeding concentrates heavily to deep-milking cows, so long as they give a profitable response in the pail. Table as follows:—

				£ s. d.
Silage	..	3,570 lbs. at £1 0 0 per ton	=	1 11 10
Bran	..	3,691 lbs. at £5 0 0 ..	=	9 4 6
Oat Chaff	.	1,713 lbs. at £2 15 0 ..	=	2 2 0
Lucerne Hay	.	3,166 lbs. at £3 0 0 ..	=	4 4 10
Green stuff	..	8,400 lbs. at £0 15 0 ..	=	2 16 3
Gluten Meal	..	200 lbs. at £6 0 0 ..	=	0 12 0
Total	..	23,740 lbs.		£20 11 5

Value of Muria's Yield Compared.

Assuming that 2½ lbs. of fresh milk is equal to 1 lb. of lean meat—the 1,497 gallons of milk produced would be equal to 5,988 lbs. of meat—an amount that would require about six good bullocks to provide.

Taking the butter-fat in the milk alone, the value at 1s. per lb. is £44 4s. 2d., and, assuming £10 as the value of a good steer in normal years, the value of Muria's fat production is greater than the ordinary market price of four steers. Again, if the value of her milk yield is put at 8d. per gallon, *i.e.*, £49 18s. 1d., then her yield was equal to the value of five steers.

Muria produced that amount in one season, in addition to a good calf, which was sold for £18 18s., while the five steers would take four or five years to mature and reach the corresponding value.

Profit and Loss Account.

Muria's feed cost was £20 11s. 5d., to which may be added £4 8s. 7d. as the cost of labour, the total cost being thus £25. On this basis it will be seen that the butter-fat cost 6¾d. per lb. to produce, and the milk 4d. per gallon.

Therefore:—

	£ s. d.	£ s. d.
Credit—Milk, 14,972 lbs. at 8d. per gallon (10 lbs.) ..	49 18 1	
Value of manure	2 10 0	
Sale of calf	18 18 0	
		71 6 1
Debit—Cost of feed and labour		25 0 0
		1

WHEAT AND THE WAR.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

II.

In a former article (written November, 1914) a historical summary of the effect of continental wars on London wheat prices over a period of 150 years was given. It was shown that in times of war prices fluctuated violently, and were relatively high, and that the high level of prices continued for some years after the declaration of peace. A statistical review of the world's wheat production for the past thirty years was given, and from a study of the statistics of world's production and consumption for 1914 it was concluded that wheat prices must inevitably advance beyond the then existing prices (44s. per quarter). Since then prices have fluctuated from 55s. to 66s. per quarter.

It was also argued that, as an era of high prices was being ushered in, there was a fine opportunity for Australia in general—and Victoria in particular—to profitably increase the volume of agricultural production. Detailed figures were given to show that a seeding of 4,100,000 acres of wheat, or an increase of 35 per cent. in acreage, could reasonably be expected from Victoria in 1915. Finally, it was pointed out that a survey of meteorological records of the Commonwealth States for the past forty years showed that droughty seasons were invariably followed by seasons of heavy winter rainfalls, and that this should be an additional incentive for planting a record acreage this season.

The official figures for the area under wheat for Victoria for 1915 were recently published by the Government Statist, and they show that the acreage under wheat this season is 4,160,800 acres.

Judging by the flooded state of our rivers, it would appear as if the winter rainfall this season will far exceed the average.

In the present article it is proposed to consider the rise in prices that has taken place since the previous article was written, the factors responsible for this rise, and the prospects for the future.

I.—THE RISE OF WHEAT PRICES.

Immediately after the declaration of war all the European countries hastened to protect themselves by two administrative Acts—(1) The prohibition of export of wheat. (2) The abolition of Customs duties on foreign wheat. This applied not only to countries which ordinarily import wheat, *e.g.*, Germany, Austria, Belgium, France, Great Britain, Italy, Holland, and Switzerland, but also to exporting countries like Roumania, Canada, Argentine.

In the case of the importing countries the prohibition has probably been rigidly enforced, but the exporting countries have since permitted export under special permit.

The import duties were, in most cases, considerable, *e.g.*, in Germany the import duty was 11s. 10d. per quarter, Austria 11s. 6d. per quarter, France 12s. 3d. per quarter, Italy 13s. per quarter. The effect of the abolition of import duties would naturally be to encourage the import of wheat into these countries.

Since July, 1914, there has been an enormous rise in the price of wheat in all countries except France, and in February, 1915, the price of wheat in Great Britain, Italy, Canada, and United States was 60 *per cent.*—90 *per cent.* higher than pre-war prices. The following table summarizes the price of wheat in the principal wheat markets of the world in February, 1915, as compared with prices at the outbreak of war. The figures are extracted from the records of the International Institute of Agriculture, Rome:—

TABLE I.—SHOWING RISE OF PRICES OF WHEAT IN IMPORTING AND EXPORTING COUNTRIES.

Country.	Market.	Class of Wheat.	Price per Quarter (8 bushels). At Outbreak of War, July, 1914. Shillings per Quarter.	Price per Quarter (8 bushels). 12th February, 1915. Shillings per Quarter.
		IMPORTING COUNTRIES.		
Great Britain ..	*Liverpool* ..	*Manitoba No. 2* ..	35·5	65·8
France ..	Paris ..	National	47·2	54·7
Italy ..	Genoa ..	National	45·5	72·6
		EXPORTING COUNTRIES.		
Canada ..	Winnipeg ..	Northern No. 2 ..	29·5	49·6
United States ..	Chicago ..	Hard Winter No. 2	27·0	52·1
Argentine ..	Buenos Ayres	Barletta	33·1	45·2

PERCENTAGE OF RISE COMPARED WITH PRE-WAR PRICES.

		Per Cent.			Per Cent.
Great Britain	=	86	Canada	=	70
France	=	16	United States	=	93
Italy	=	57	*Argentine*	=	37

The small increase in price in France up to February is probably due to the large imports immediately following the declaration of war, and the abolition of the import duty of 12s. 3d. *per* quarter.

Within five months France had imported twenty-nine million bushels of wheat to supplement her own supplies.

The high price in Italy was due to fears of a scarcity of wheat, due to the fact that, though Italy had only an average crop in 1914, she had imported during the first five months of the war only 6,300,000 bushels of wheat, as against a normal import for this period of 20,000,000 bushels. During the period under review there has been a great increase in the difference of price between the exporting and importing markets and this increase, of course, has to cover the cost of transport, handling, insurance, and war risk, and middleman's profits. There has also been a great increase in price of wheat in the exporting markets

II.—CAUSE OF THE HIGH PRICES.

Let us consider the factors responsible for this rise in price, for this will enable us to appreciate the probable position of Australian wheat when harvest time comes round.

The price of wheat to-day in London is 56s. per quarter, or 7s. per bushel, c.i.f. and e., *i.e.*, cost, insurance, freight, war risk, and exchange.

Many factors have been responsible for the increase in price over pre-war times. The most important of these factors are: (1) Increased cost of freight, war risk, and exchange; (2) shortage of wheat production for 1914 in Europe, Canada, and Australia; (3) destruction of grain crops and foodstuffs in the zone of conflict; (4) sentimental reasons, bringing in the psychological factor, viz., the uncertainty of what is to happen, leading to large imports by neutral countries and belligerents. Let us consider these factors seriatim.

Increased Cost of Freight, etc.

The increased cost of freight has been a most important factor in causing a rise in price in the importing markets. The total disappearance of the German mercantile marine from the high seas, and the commandeering of a large percentage of the British ships for transport of troops and munitions of war, have resulted in the supply of ships falling very far short of the demand. As a result freights have risen in every part of the world in a remarkable manner. As an example, we may consider the freights on wheat from Argentine, United States, and India to Liverpool and Genoa in February, 1915, with those of the previous two years. The following figures (taken from the Daily Freight Register) illustrate the point:—

Table I.—Showing Freights on Wheat in Shillings Per Ton for the Past Three Years from United States, Argentina, and India, to Liverpool and Genoa.

From—	To—	February, 1913.	February, 1914.	February, 1915.
		s. d.	s. d.	s. d.
New York ..	Liverpool ..	15 0	6 1	34 5
River Plate ..	" ..	22 6	8 0	72 6
Bombay ..	" ..	19 0	13 6	50 0
New York ..	Mediterranean ..	23 11	12 10	47 10
Buenos Ayres ..	" ..	16 3	5 9	52 11
Bombay ..	" ..	19 0	12 0	45 0

The freights prevailing prior to the outbreak of the war were exceptionally low. Those of the previous year (1913) are nearer normal figures. But the figures show an extraordinary increase in the price of freight. The greatest increase has been noted in Argentine freights. The freight in February last was nine times what it was at the outbreak of war.

The freight on wheat from Melbourne to the United Kingdom prior to the war was approximately 30s. per ton, or 10d. per bushel. The present quotation is in the neighbourhood of 85s. per ton, or 2s. 3d. per bushel. The question of freight is the most serious problem in the financing of the Australian wheat crop. With freights fluctuating from

week to week the ordinary wheat trader must take bigger risks in shipping wheat than in ordinary years, and will require additional recompense for this risk. Insurance has increased from 12s. 6d. to 17s. 6d. per cent. and telegraphic exchange from £1 to £1 10s. per cent. These extra prices cause a corresponding decrease in the export value of the wheat.

OBSTRUCTION OF SUPPLIES.

One of the most potent factors in the grain market has been the locking up of Russian supplies, owing to the closing of the Dardanelles. The enforced withdrawal of Russia's surplus from the world's markets has been largely instrumental in forcing up the price. No figures are available as to the probable supplies of wheat at Black Sea ports, but the amount must be in the neighbourhood of one hundred million bushels. The locking of the Dardanelles has had the same effect on markets as a severe crop failure, causing, pro tanto, a shortage in the world's available supply.

The possibility of forcing the Dardanelles and the consequent liberation of the imprisoned Russian surplus has been responsible for violent fluctuations in price during the past four months. The sharp rise of wheat prices last February was dramatically checked by the Allied attack on the Dardanelles, which in its early stages was regarded to mean a speedy opening up of the Straits. As soon as the Allied guns began to batter the forts, British farmers began to rush supplies on the market, and the price of British wheat dropped to 52s. per quarter. When it became clear that the forcing of the Straits would be a protracted task, the price recovered, and 68s. 6d. was given for British wheat in May. Since then the price has once more eased to 55s.

SHORTAGE OF WHEAT PRODUCTION IN 1914-15.

Exactly what quantity of wheat was actually harvested in 1914 will probably not be known until the declaration of peace. There seems to be little doubt, as pointed out in Article 1., that the world's wheat crop in 1914 was only 90 per cent. of that obtained the previous year. Such shortage would naturally react on the market values, and stiffen prices, but this would gradually bring a compensating factor into operation. As prices continue to rise, economy would be effected in using wheat, less grain would be fed to stock, other and cheaper foodstuffs would begin to replace wheat, and consumption slacken; so, even a 90 per cent. harvest could be made to suffice. Such diminution in wheat consumption is possible, however, only when other foodstuffs remain relatively low in price.

DESTRUCTION OF GRAIN AND FOODSTUFFS IN ZONE OF CONFLICT.

There can be no doubt that vast quantities of foodstuffs were destroyed and crops devastated during the summer of 1914 in Poland, East Prussia, Galicia, Belgium, and France. So far as the Eastern area of conflict is concerned, the information received is meagre, but in the continual ebb and flow of the thousand-mile battle front we know that immense quantities of grain and flour have been destroyed by both combatants

So far as the Western front is concerned, Daniel Zolla, in discussing (*Revue des Deux Mondes*) the Agricultural Production of France and the Public Food Supply, throws interesting light on the subject of crop

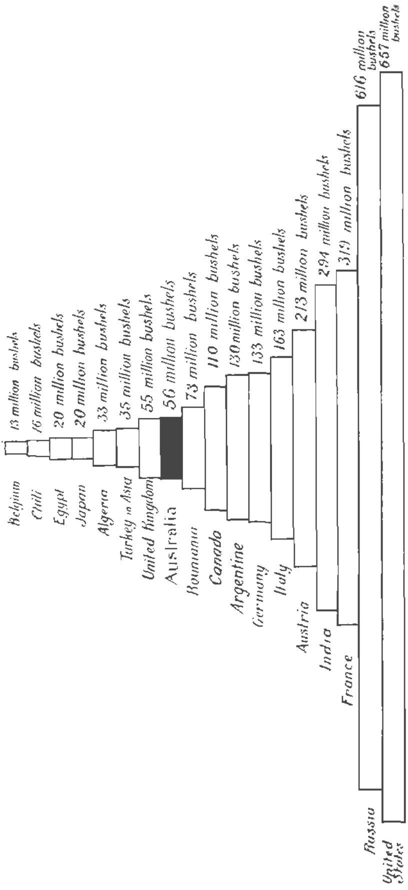


Diagram showing Average Yearly Production of Wheat for past ten years in various wheat-growing countries of the world.

destruction by the enemy, and incidentally shows the difficulties confronting agricultural production in the belligerent countries. He points out that on the day of mobilisation (2nd August) a large part of the wheat and oat harvest of France had not been threshed—the grain was still in the ear—and that in all the districts successively traversed or occupied by the combatants, the enemy destroyed the greater portion of the harvest, the cattle, and the fodder necessary for the support of these animals.

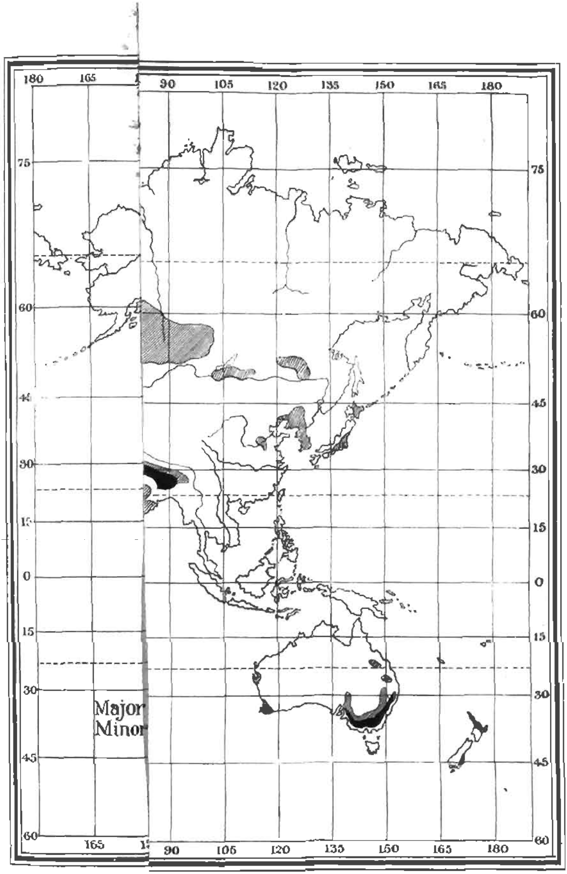
The areas invaded normally produced 18 per cent. of the French wheat crop and 25 per cent. of the French oat crop, *i.e.*, sixty-two million bushels of wheat and forty-four million bushels of oats. The departments occupied by the enemy—Aisne, Ardennes, Meurthe, Marne, Meuse, Nord, Pas de Calais, Oise, Vosges—possess 1,600,000 cattle, 1,450,000, sheep, 654,000 pigs, and these have been decimated. They represent one-tenth of the total farm stock of France, and a capital of £20,000,000. The greatest losses have occurred in the sugar beet crop. The departments invaded produced no less than 580,000 tons—80 per cent. of the total production of sugar of France. These sugar beets are normally dug in October, but most of the sugarworks and distilleries have been wrecked, and will not be able to receive beetroot at the proper time. In discussing the future harvest, Zolla says:—

"We believe that agricultural production suffices for the time being for the needs of consumption, and that the general food supply is assured for nine or ten months. Certainly this is very satisfactory, but it is necessary to think of a more distant future. Agriculture should prepare, and that certainly a long way ahead, for the harvest of the year following.

"What is going to be done? What can be done to see that the 1915 harvest is sufficient for our needs and to spare France a scarcity in 1916? The problem is important enough to be fairly set out and studied.

"Certainly the public is often badly informed when agriculture is in question, but nobody is ignorant of the fact that land is productive only if properly prepared—that is, properly manured and properly sown. How should all this be done to secure a good crop for next year? It is not a duty that can be put off except at the risk of ruin or serious danger to the crop. Strictly speaking, autumn cereals might be sown at the end of winter, but that is a deplorable expedient. Wheat sown in October to December is nearly always better than that sown in February and March. Autumn ploughing is, so to say, indispensable. Note carefully it is not a question of an operation limited to a small area. For wheat alone, six million hectares (14,826,600 acres) must be prepared, and time presses, for the work should commence in a fortnight, or at least in a month. But the land is covered with crops—crops of potatoes, crops of sugar beet or fodder beet. It is a tremendous task when nobody remains on the farms but women, children, and old men. The teams are short. Many horses have been requisitioned; many oxen have been sold. The fact cannot be concealed—in many cases our fields will remain fallow till Spring. The vines will not be pruned or receive proper treatment. But we have confidence in the unconquerable energy of the country population. From one end of the country to the other efforts like miracles will be made, and just as our young men will show their bravery on the frontier, the guardian of the family at the hearth will raise herself up, strong, ingenious, and obstinate. Our old land has produced defenders; under the efforts of those who remain it will still produce harvests. In this respect the subdivision of property and of cultivation will facilitate a task which the employment of paid labour on large areas would make almost an impossibility. Disasters will at least be limited, if not avoided, and to announce a famine and foresee the barrenness of our neglected fields would be to misunderstand badly the courage of the French peasantry, whether men or women."

Probably the greatest destruction of crops and foodstuffs has taken place along the Eastern front, and especially in Poland and Galicia. Poland produced in 1908 21 million bushels of wheat, 78 million bushels



Minor Sources of Supply.

of rye, 66 million bushels of oats, and 24 million bushels of barley. It is the most densely populated of all Russian provinces, the average density of population being 232 per square mile. It is significant that the recent great drive by the enemy in Poland coincided with the ripening of the wheat and rye crops. Thus Professor A. J. Voerkov, of the Petrograd University, points out that the mean ripening period of wheat in Poland is 6th August, that of rye 27th July, and oats 19th August. There can be little doubt that the greater portion of the growing crops and stores of grain in Galicia, Poland, and the Baltic provinces were destroyed by the Russians in their recent retirement. This will cause the reserves of grain that might otherwise have been exported to be drawn upon, and less will, therefore, be available for export, when the Dardanelles are opened.

III.—THE PROSPECTS OF THE 1915 WORLD CROP.

In Article I. we saw that the estimated world crop for 1914 was likely to be about 90 per cent. of the previous year's production. What was the actual crop?

In the Northern Hemisphere the wheat harvest begins in India in March, and continues in one country or another till September, the largest area being reaped in July and August. In October and November there is practically no wheat reaped anywhere in the world. In December and January Australia and Argentina take off their harvests. In February there is a blank. Consequently the world harvest is usually reckoned as being finished in February.

According to the International Institute of Agriculture, Rome, the production for the year 1914 (ending February, 1915) was 3,914,048,000 bushels, as against a production in 1913 of 4,241,528,000 bushels, *i.e.*, 92 per cent. of the previous year.

What will be the production of 1915? If we could forecast this we should be in a very good position to estimate the probable variation of prices.

In the first place, the belligerent countries have special reasons for straining every nerve to increase the area sown for the next harvest, whilst, on the other hand, they will find it difficult to sow the usual area, owing to the withdrawal of a large proportion of their male agricultural population for military service, the scarcity of manures, the want of sufficient farm animals, and the actual threatened presence of troops on part of their wheat-producing area.

Consider the immense task confronting French agriculture, in view of the difficulties described above by Zolla. Nor is the task confronting Germany and Austria less formidable.

Even if we disregard the human factor—the shortage of men engaged in agriculture in these countries—other considerations will show how vitally agricultural interests have been affected by the war. With the declaration of war all trading with the enemy ceased. Potassic manures, nearly all of which come from Stassfurt in Germany, have been cut off from England, France, and Russia; whilst, on the other hand, all supplies of nitrate of soda from Chile and Peru have been cut off from the enemy by the British Fleet.

Nitrate of soda is as important a manure to European agriculture as is superphosphate to Australian agriculturists. Potash, not generally used on wheat crops, is very widely used for roots and grass in Britain

and France, consequently the dislocation caused by the lack of potash on the one side and the lack of nitrate of soda on the other will seriously interere with crop yields this summer.

Again, these countries all practice intense culture. They must do this to maintain such dense, crowded populations. But intense culture is inseparably bound up with plentiful supplies of labour and very thorough working and preparation of the land, and conservative, long established systems of crop rotation. It may be supposed that these countries will endeavour to increase the acreage sown to wheat, in view of the high price and possible shortage. But, with an intensive system of farming, it is not easy to break away from a rotation that has been hallowed through generations of custom in order to augment the area of any one crop; indeed, to do so might prove fatal to the nation's interest.

The area under oats, for example, must not be reduced, for this grain may conceivably be as useful to a nation at war as wheat; and, judging by prices, oats are wanted more badly in enemy countries than wheat. Nor can the area under potatoes be diminished, for potatoes will certainly produce more food per acre than will wheat. If the cultivation of this crop be diminished (and the sowing of potatoes requires much labour and careful soil preparation) there will be a serious falling off in the food supply, and a greater demand will set in for wheat. Nor must the quantities of fodder produced be curtailed, for the meat supply must, under any circumstances, be maintained, for meat is essential for all modern troops. The modern army fights "on its stomach," and meat is as necessary as bread. Experience of previous wars, when England was less dependent on foreign supplies for wheat, shows conclusively that high prices ruling for wheat in previous continental wars did not lead to a material increase in the area sown to this cereal. Statistics of the present crop show that in spite of the special encouragement given to British farmers the production for 1915 has not materially increased. All these obstacles must result in a reduction of (1) the area sown; (2) the average outturn per acre in Europe. All round it may be estimated that the total yield of Europe cannot be more than 80 to 85 per cent. of its normal production for the past five years; and this, taken by itself, will mean a diminution of 8 to 10 per cent. in the world's annual crop. The shortage may possibly be greater.

The accompanying map of the world shows the major and minor sources of wheat supply of the world, and brings home very forcibly the immense acreages sown to wheat in Europe, and how a shortage in European production must necessitate vastly increased output in the new world, if an actual shortage is to be avoided.

The average annual production of wheat for the past ten years in each of the more important wheat countries of the world is shown in the accompanying diagram (page 549). It vividly portrays the enormous wheat production in the belligerent countries as compared with the rest of the world, as well as the comparatively insignificant position occupied by Australia among the world's wheat producers. If there are any who still think that accelerated wheat production in Australia will materially lower the world's price of wheat, a glance at this diagram should give stimulating food for thought.

Can India, United States, Canada, Argentina, and Australia make up for Europe's deficiency and Europe's requirements in 1915?

RED POLL DAIRY CATTLE.

Report on the Departmental Herd for Season 1914-15.

By R. R. Kerr, Dairy Supervisor, Central Research Farm, Werribee.

In submitting the report for 1914-15 on the Red Poll Herd at the Research Farm, Werribee, some mention must be made of the severe drought, which has dealt so severe a blow to our dairying industry that some years must elapse before complete recovery is possible.

Many thousands of our best dairy cattle have died, and many others in good condition have been slaughtered for beef, to supply the needs of the meat market. This drought has been the most severe in the history of the dairying industry in Victoria, as it affected not only the

"Butter and Beef."

This Red Poll appears to supply an answer to the question frequently asked—"Is there a genuine dual purpose breed?"

northern areas, but also the famous Western District, which has so often been our standby in the past.

On this occasion great havoc was wrought in this favored district, where not half the farmers make any fodder provision for their dairy cattle. The recent drought found them unprepared. It is to be hoped the lesson will be taken to heart, and ample provision made in the future. Usually in this fair province, green fodders grow well, and pastures are plentiful. Farmers do not seem to realize the value of grass hay—it has a feeding value nearly equal to oaten hay, and when well cured is just as palatable. Then again the silo is not yet firmly established—filled, it stands as a sentinel guarding its owner against drought.

Rates, taxes, &c., are often the cause of much criticism, but many times the amount of these is lost owing to neglect in providing sufficient fodder to carry the cattle through times of scarcity. This holds true also when duffer cows are permitted to remain in a herd.

This gambling in the dairy business should cease; we must make provision for the lean years and the dry times; summer crops must be grown or silage provided.

A commercial institution has its reserve fund, and the farmer's reserve fund should be sufficient stacks of fodder, or a well filled silo. Government officers have for many years continually emphasised the conservation of fodder crops and the testing of cows.

When these important factors towards success are realized, then we can compete with other countries on an equal footing. It is hoped that the lesson taught this year may be of everlasting benefit to the farmers, and arouse in them some humane consideration for their cattle.

"Vuelta," one of the Deparment's High Testing Cows.

Milk yield, 1914-15, 34 weeks, 7,560 lbs.; butter fat test, 4.4; butter fat yield, 338.28 lbs.; commercial butter, 385.64 lbs.; value, £16 18s. 3d.

While only eighteen months have elapsed since the Red Poll herd was taken to Werribee, the conservation of fodder was especially borne in mind, and a large reserve of silage was the means of enabling the cattle to greatly increase their yearly average in a season when so many failed, and prices for produce so high—the time when an intelligent, thoughtful farmer reaps his just reward.

Any neglect in feeding dairy cattle has a far reaching effect, and the condition of the cattle one season will probably affect the next year's production. On the other hand, plenteous feeding builds up a reserve in the animal's body, and often allows a dairy cow to maintain a fair yield, though on a ration short of the desired nutrients. During the past season, the restricted supply of concentrates necessitated the dropping of bran from the ration, and since last September only the following cows received 3 lbs. bran each daily:—"Vuelta," "Sumatra," "Persica,"

"Europa" "Goldleaf," "Mexicana," "Egypta," "Pennsylvania," "Cuba," "Bullion," "Birdseye," "Virginia." "Muria," the subject of a special report, received varying amounts up to 12 lbs. daily, and was easily the most profitable cow in the herd. This restricted feeding will affect the following year's average, cows last season giving a gallon a day more. Many, however, are giving over 4 gallons a day now, while "Netherlana," full of dairy quality, is yielding 50 lbs. daily.

The 3 lbs. of bran mentioned above is insufficient to maintain the heavy flow, such as many of the Red Polls yield. While the general balanced ration is placed at 2½ lbs. of protein, ½ lb. of fat, and 12 of carbo-hydrates, many cows need a much greater quantity of protein and exceptional cows will yield a profit on over 3 lbs. of protein.

In feeding for production the individuality of the cow is of the greatest importance, some animals will be at their maximum on 3 lbs. of concentrates, others can profitably be fed 12 lbs.

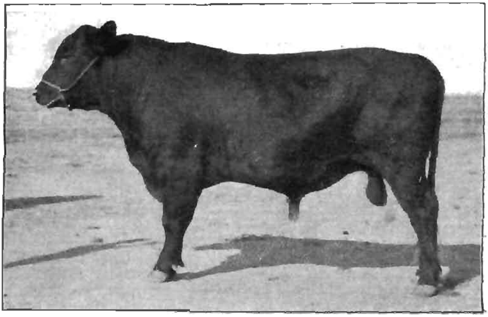
Although some restricted investigations were made on account of the intervention of the drought year, the programme of feeding experiments of an extended form has not yet been fully entered on. The findings therefrom should prove of great interest to students of dairy economics, and arouse an interest in dairy farming and animal feeding. At present a great loss is experienced through lack of knowledge of that important subject—Foods and Feeding.

In the previous report special mention was made of the dual purpose qualities of the Red Poll breed—the year's experience has proved this to a marked degree. For example, "Atlanta," which produced 315 lbs. butter on her first calf, and after milking eight months on her second period, and when yielding 16 lbs. of 5 per cent. milk daily, weighed 1,570 lbs. live weight. Then again "Cigarette," which last season produced over 1,000 gallons of milk and 448 lbs. of butter sold for £22 7s. 6d. at the Melbourne yards in the month of May; and two others, "Gilt" (4 years) and "Crimson Thread" (3 years) realized £29 and £27 per head in the Melbourne fat stock yards in August.

Despite all arguments to the contrary, the beef and milk producing qualities are combined in the Red Polls, though continual selection for milk production over a number of years may possibly result in a less beefy animal, as development in one particular line is always considered to be at the expense of some other quality. Apart from their beef qualities, however, the season's records show that this herd compares very favorably with the best of the herds of the special dairy breeds

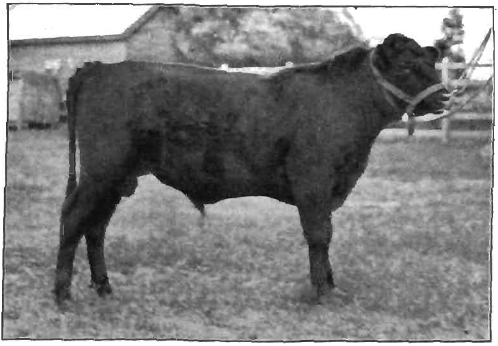
Many visitors to the farm when inspecting the herd have made the comment, "Too fat for milking, all fit for the butcher." The records answer the "too fat" remarks, which generally come from admirers of the special dairy breeds. No good judge of cattle, with a lengthy experience, who makes an impartial decision, will deny the superiority of the Red Poll when the object is milk production combined with beef raising.

When it comes to a battle for existence in drought times, the Red Poll will be one of the last to succumb. As a great shortage exists in the meat markets of the world, and an alarming depletion of our flocks and herds has occurred, high prices for beef are predicted in the future, Red Polls



"Longford Major" (imp.) 2 years old.

Imported by the Department of Agriculture, Victoria. Dam's record, 1,471 gallons; average over 6 years, 1,138 gallons.



"Belligerent" (imp.) yearling.

Imported by the Department of Agriculture, Victoria. (The milk records of nine of the female ancestors of this young bull average over 1,000 gallons of milk per annum, extending over from 2 to 12 lactation periods—average of seven years.)

will assuredly be one of the breds to replenish the wastage because of the ability of the breed to produce good beef animals. When Red Polls sires are used with other breeds 80 per cent. of the resultant progeny are hornless, and have the rich red colour of the breed. As beef cattle they are greatly in demand in England, and compare very well with other beef breeds, dressing up to 73.72 per cent. of the live weight. This, according to the *London Live Stock Journal*, had only once been exceeded in England at that time, and never by a full blood steer of any breed.

Many inquiries are made from farmers and graziers anxious to become possessed of the breed. The hornless character of the Red Poll is one of its strongest points, and largely accounts for the exceptional docility of the herd at Werribee. Nearly every large herd in the main dairying districts contains many cows injured or ruined by those useless ornaments, horns, and all dairy calves should be dehorned when a few days old. No such accidents occur with Red Polls.

The Young Stock.

Seven heifers were tried during the season, and the majority of them show promise of heavy milk production, fresh drafts into the herd are milking well, but have not concluded their term.

The older members of the herd have set up a very high standard, and some difficulty may be experienced in procuring a sire that will stamp a general increase of milk production in his progeny; but the recently imported sires, "Longford Major" and "Belligerent" are very promising, and come from families noted for milking qualities. as will be seen by reference to the detailed particulars of these importations in last month's *Journal*.

The year's operations and the consequent results have proved what a splendid opportunity awaits any enterprising and intelligent dairy farmer, who possesses an irrigated block on the Werribee settlement, when the water supply is assured. Land so close to Melbourne that will grow lucerne to perfection, and probably carry a beast to the acre, is pre-eminently suited for dairy farming for a town milk supply. The Department was at odd times adversely criticised for attempting to dairy at Werribee, mainly by farmers who rely on pasture for their cattle, but the return of nearly £30 per cow is sufficient answer to such critics. The selling price of the Werribee milk is estimated on a basis of 9d. per gallon, but a price much beyond this amount was obtained during part of the season.

An average yield of 900 gallons is possible from a well selected herd of special dairy cows, which would mean a return of over £30 per cow.

The returns from the Red Polls at the Research Farm, Werribee, should be a considerable factor in establishing the industry in the district. Does any other district present a better opportunity?

The herd has proved itself commercially, but the ultimate object is experimental work, when varying treatments will probably affect the yields. Breeding and feeding trials should have the loyal support of all dairy farmers who take into consideration the economics of their business.

The dairy work proceeding at the Research Station, Werribee, should help to define improved methods and their manner of application, as the standards of other countries are not always applicable to ours.

Victoria, as a dairying country, would most probably rank with the best producing countries of the Old World, but our average returns are much less, because our methods are at fault, and we do not take advantage of our opportunities.

The Year's Returns.

The average yield of 808 gallons of milk and 374 lbs. butter fat from the cows, and 559 gallons of milk and 261 lbs. butter fat from the heifers is much above the general average of herds. Ten cows gave 400 lbs. and over of fat, while six, "Muria," "Cuba," "Virginia," "Bullion," "Pennyslvania," and "Egypta," yielded over 1,000 gallons of milk. The average test of all the cows over the whole milking period was 4.6, only four cows being below 4 per cent.

"India," the last on the list of the cows, calved prematurely, before completing the previous term, and, consequently, seriously affected this year's performance.

A quartette of the Werribee Red Poll Milkers grazing a patch of green barley.

"Birdseye," "Virginia," and "Turka," were sick for portion of the time, while "Havana" and "Kentucky" suffered from lameness at intervals.

In comparison with previous years the heifers performed very well. "Pipio," ex. "Connecticut," "La Reina," ex. a daughter of "Virginia," and "Mongolia," ex. "Asiana," are welcome additions to the herd, while the others also performed satisfactorily. "La Reina," after calving prematurely, put up a splendid return.

At the time of writing the majority of the best cows are still to calve, and are in splendid condition. It was intended to compete in the butter test at the Royal Show, and if the Show had been held I feel sure the Red Polls would have made a good showing—their docility somewhat adapting them to hand feeding.

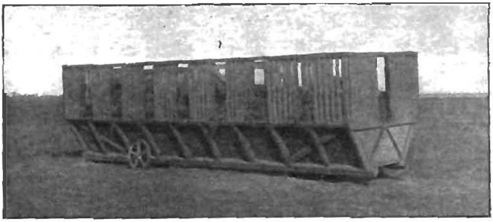
Feeding the Cows.

Realising that the feeding of the cattle is the most important item in dairy farming, and any neglect in this respect has an immediate effect on the returns, special attention was given to this subject. The old adage, "Feed is half the breed," has a great deal of truth in it. At

Werribee pasturage is very scanty, and at times non-existent, so that when the herd was brought to the farm it was decided to feed the cows twice daily in the bails, and outside once in the forenoon and again at night, making in all four times a day. This regularity in feeding is a great improvement on the twice a day method adopted in some dairies—"a contented mind is a continual feast," and it applies to the cow as well as to its master. Though methods had at times to be altered, the general practice was to feed a silage and straw mixture in the bails, and for rack feeding outside cut green stuff in a wilted condition in the forenoon, and lucerne hay at night.

The outside feeding was done in racks, easily movable, an illustration of one, the design of Dr. Cameron, is shown. This method of feeding is preferable to the old method of throwing on the ground, the amount of feed saved soon paying for the money expended in the making of the rack.

Lucerne has generally supplied the roughage, and was cut one day and fed the next. Whenever possible grazing was provided, and some of the fodder crops were used in this way. The cows generally made



Portable Rack Designed to Prevent Waste.

a slight increase in their milk yield, but spoiled a considerable portion of the feed, and it is intended to experiment in this direction to prove which is the more economical method of feeding. The general ration was—daily, 27 lbs. silage, 30 lbs. green stuff, and 8 lbs. lucerne hay.

The best silage from a milk producer's view was a cereal and legume mixture—rye, barley, oats, peas, and beans.

Maize silage was also fed, and much relished by the cows, but one point, which must be borne in mind, is that sour silage made from immature maize has a bad effect on the quality of the milk. At the beginning of the year, when the prospect for succulent fodders was at zero, it became necessary to convert some of the lucerne into silage. This was put into the silo in a slightly wilted condition, and was mixed with a small amount of oaten straw. This silage has been fed for some considerable time, and it is a splendid sample. The experience gained this year forces the opinion that no dairy farm is complete without a silo. There is far less energy used by the dairy cow when converting succulent fodders into milk than when supplied with a mass of dry feed.

Experiment in Feeding Concentrates.

Many farmers are often disappointed at the return from their cows when fed on increase of concentrates. While the conclusion in the experiment under review proves an entire waste so far as extra fat is concerned, there was an increase in the amount of milk, but not sufficient to justify the expenditure, and evidently "India" was yielding her maximum on the 3 lbs. of bran as concentrates.

This is an extreme case, and should not be taken as final, as other cows fed in the same manner paid for the increase. It serves as an instance of the desirability of knowing the individuality of every cow in the herd.

"India" was calved 27 days, and is of good temperament; the weather was mild.

Feed previous to experiment—Green lucerne 30 lbs., lucerne hay 10 lbs., silage and straw chaff mixture 17 lbs., bran 3 lbs.

The silage was replaced with bran on the 4th April, making 16 lbs. bran daily.

Experiment No. (1).

YIELD, SEVEN DAYS PREVIOUS TO 16 LBS. BRAN.

Date.	Lbs. Milk.	Test.	Fat Lbs.
March 29	37	4·2	1·583
" 30	37	4·1	1·549
" 31	40	4·2	1·697
April 1	39	4·1	1·620
" 2	40	4·3	1·720
" 3	42	4·3	1·806
" 4	40½	4·3	1·741
Total	275½	4·25	11·716

SEVEN DAYS RESULTS AFTER 16 LBS. BRAN.

Date.	Lbs. Milk.	Test.	Fat Lbs.
April 5	42½	3·6	1·530
" 6	43	3·7	1·624
" 7	43	3·3	1·451
" 8	43	3·2	1·376
" 9	43¾	3·9	1·742
" 10	44	4·9	2·156
" 11	41¾	4·2	1·753
Total	301	3·86	11·632

An increase of 25½ lbs. milk and a decrease of .084 lbs. fat.

Experiment No. (2).

Object.—Data on the theory that grazing cows on lucerne increase the fat percentage in the milk. On the four days previous normal conditions prevailed, the cattle being fed green lucerne in the racks in the forenoon—the following four days the same conditions existed except that instead of eating lucerne from the racks, the cows were allowed to graze.

Eight cows were in the group, and they were well on in their lactation period.

Feeding Method.	Lbs. Milk.	Test.	Fat Lbs.
Hand Fed	907½	4·70	42·667
Grazing	925½	4·78	44·287

Difference in favour of grazing 18 lbs. milk and 1.62 lbs. fat.

Result.—The grazing on the lucerne shows very little increase, and probably the cutting is the more economical.

YIELDS AND RETURNS OF THE GOVERNMENT HERD OF RED POLL DAIRY CATTLE.

Season 1909-10.

Heifers.

Name.	Days in Milk.	Milk in lbs.
Kentucky	306	4,335
Virginia	276	4,271
Cigarette	295	4,047
Havana	270	3,151
Average	287	3,951

No tests available.

Season 1910-11.

Cows (2nd Calf).

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Bullion	283	40½	7,730	4·2–5·0	356·71	406½	17 16 8
Virginia ..	283	40½	6,362	3·8–4·6	254·75	290¾	12 14 9
Havana ..	283	40½	5,750	3·8–4·6	229·97	262¼	11 10 0
Kentucky ..	245	35	5,310	4·0–4·6	225·98	257½	11 6 0
Cigarette ..	238	34	5,040	4·0–4·5	211·61	241¼	10 11 7
Beulah	135	19¾	3,970	4·2–4·9	200·44	228½	10 0 5
Average for 6 ..	244½	30	5,693⅔	4·3	246·59	281	12 4 11

Season 1910–11.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Vuelta	270	38½	5,560	7·0–7·8	405·14	461¾	20 5 1
Connecticut ..	283	40½	6,182	4·2–4·6	269·06	306¾	13 9 0
Carolina ..	283	40¼	5,700	4·2–4·8	253·14	288½	12 13 1
Muria	283	40½	5,480	4·2–6·2	240·70	274¼	12 0 8
Cuba	283	40½	5,260	4·2–4·8	231·89	264½	11 11 11
Pennsylvania ..	270	38½	4,610	4·0–4·4	189·75	216¼	9 9 9
Average for 6 ..	278⅔	34	5,465	4·7	269·94	300·12	13 4 11

Season 1911–12.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Vuelta	289	41¼	7,750	5·2–8·2	485·1	553	24 5 1
Connecticut ..	283	40½	6,780	4·6–6·4	364·0	415	18 4 0
Bullion	305	43½	6,940	4·8–6·2	344·0	392¼	17 4 0
Beulah	278	39¾	6,460	4·9–6·4	342·0	390½	17 2 7
Cuba	304	43½	7,015	4·4–8·4	337·8	385	16 17 9
Cigarette ..	291	41½	6,480	4·0–5·6	285·9	326	14 6 0
Sumatra ..	293	42	6,660	4·0–5·0	284·2	324	14 4 1
Kentucky ..	277	39¼	6,690	4·0–4·8	277·7	316¼	13 17 8
Muria	286	41	5,800	4·5–7·0	275·7	314¼	13 15 8
Pennsylvania ..	318	45¼	6,340	4·0–5·2	271·9	310	13 12 0
Carolina ..	226	32¼	5,800	4·0–5·0	254·3	280	12 14 4
Virginia	277	39½	5,510	3·9–4·6	221·7	252¾	11 1 9
Havana ..	262	37½	5,350	3·8–4·5	215·3	245½	10 15 4
Average for 13	283	40½	6,355	4·7	304·6	346½	15 4 7

Season 1912–13.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Muria	256	36½	5,780	4·5–7·3	314·96	359	15 15 0
Bullion	239	34	6,490	3·8–6·8	296·90	338½	14 16 10
Egypta ..	295	42	6,581	3·7–5·2	283·5	323	14 3 6
Virginia	259	37	6,500	3·6–5·7	282·56	322	14 2 6
Cigarette ..	273	39	6,810	3·9–4·8	278·56	317½	13 18 6
Connecticut ..	320	45¾	6,100	4·0–7·6	277·85	316¾	13 17 10
*Vuelta ..	263	37¼	6,650	3·5–5·3	273·81	312	13 13 9
Cuba	251	36	6,280	3·9–5·4	269·11	306¾	13 9 1
Kentucky ..	267	38	6,249	3·4–4·4	256·00	291¾	12 16 0
Havana ..	258	37	6,060	3·5–5·5	252·95	288¾	12 12 11
Sumatra ..	230	33	5,670	3·7–5·5	238·37	171¾	11 18 4
Pennsylvania ..	230	34¼	4,910	3·8–5·9	215·09	245¼	10 15 0
Europa	324	46¼	4,590	3·6–7·1	201·13	229¼	10 1 1
Carolina ..	274	39	4,450	3·6–6·5	198·30	226	9 16 3
Average for 14 Cows ..	267	38	5,942	4·85	259·94	295	12 19 10

Season 1912–13—*continued.*

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
Heifers.							
							£ s. d.
Goldleaf ..	287	41	6,599	4·1–5·3	316·50	360	15 16 6
Birdseye ..	285	41	4,440	3·9–8·0	256·75	292½	*12 16 9*
India ..	267	38	5,231	4·1–6·2	238·37	271¼	11 18 1
Persica ..	252	36½	4,100	4·6–7·7	218·69	249½	10 18 8
Turka ..	191	27½	3,590	4·6–5·9	178·27	203¼	8 18 3
Mexicana ..	210	30	3,830	4·0–5·1	171·58	195¼	8 11 6
Regalia ..	338	48½	3,380	4·4–6·0	161·58	184½	8 1 0
Cabana ..	273	39	3,370	4·0–5·4	153·23	174¼	7 13 3
La Suelta ..	241	34½	2,660	4·3–8·2	134·23	153	6 14 3
Average for 9 Heifers	260	37	4,132	5·3	203·24	232	10 3 3

Season 1913–14.

Name.	Days in *Milk.*	Weeks in *Milk.*	Milk in *lbs.*	Average Test.	Butter *Fat (lbs.)*	Estimated *Butter (lbs.)*	Values.
Cows.							
							£ s. d.
Cigarette ..	328	46¾	9,414¼	4·12	388·25	442¼	19 8 3
Muria ..	296	42¼	7,487¼	5·08	380·25	433½	19 0 3
Birdseye ..	297	42¼	6,542¾	5·48	358·75	409	17 18 9
Virginia ..	304	43½	8,229	4·33	356·75	396¾	17 16 3
Bullion ..	297	42½	8,177¾	4·29	350·75	400	17 10 9
Sumatra ..	330	47½	7,605	4·26	323·75	368¼	16 3 0
Vuelta ..	286	43¾	7,723½	4·14	320	364¾	16 0 0
Connecticut ..	278	39¾	7,166	4·47	318·25	362¾	15 18 3
Persica ..	298	42½	6,954½	4·57	318	362½	15 18 0
Kentucky ..	288	39¾	7,904½	*3·96*	*313·25*	357	*15 13 3*
Goldleaf ..	277	41	6,908	4·49	310·25	353¼	15 10 3
Mexicana ..	293	41	6,773¾	4·56	309·25	352½	15 9 3
Cuba ..	287	41¾	6,624¼	*4·47*	296·25	337¾	*14 18 3*
Europa ..	302	43	6,273	4·60	289·25	329¾	14 9 3
Egypta ..	288	41	6,724	4·13	277·75	316¾	13 17 9
India ..	245	35	6,150	4·36	268·5	306	13 8 6
Havana ..	240	34½	6,364½	4·15	264·25	301½	13 4 3
Turka ..	289	41¼	5,534¼	4·69	259·75	296	12 19 9
Asiana ..	260	37	4,249¾	5·30	225·5	257	11 5 6
Pennsylvania ..	249	35½	5,160	4·4	212·25	242	10 12 3
Regalia ..	297	42½	4,444	4·50	200·25	228¼	10 0 3
Carolina ..	231	33	4,322½	4·62	200·25	228¼	10 0 3
Averages of herd of 22 cows ..	284¾	40¾	6,669¾	4·49	297·25	338½	14 17 3
Heifers.							
Atlanta ..	**300**	**42¾**	**5,505¼**	**4·90**	**277**	**315¾**	13 17 0
Germania ..	**359**	**51½**	**4,218¼**	**4·74**	**199·75**	**227¾**	9 10 9
Arctica ..	**294**	**42**	**3,768¾**	**5·16**	**194·5**	**221¾**	9 14 6
Netherlana ..	**293**	**41¾**	**4,551½**	**4·18**	**190·5**	**217¼**	9 10 6
Hispana ..	**290**	**41¼**	**3,944½**	**3·95**	**155·75**	**177½**	**7 15 9**
Melanesia ..	**276**	**39½**	**3,690½**	**3·97**	**146·5**	**167**	7 6 6
Averages for 6 heifers ..	**302**	**43½**	**4,279¼**	**4·48**	**194**	**221**	9 14 0

Season 1914-15.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	365	52	14,972	5·9	884·6	1,007·94	44 4 7*
Persica	351	50	9,607	4·9	479·94	547·13	23 19 11
Cuba	337	48	10,464	4·5	478·14	545·07	23 18 1
Birdseye ..	321	45⅞	8,522	5·5	473·79	540·12	23 13 9†
Bullion	321	45⅞	10,928	4·3	468·99	534·64	23 8 11
Virginia ..	344	49	10,252	4·4	456·76	520·13	22 16 9‡
Pennsylvania ..	348	49½	10,607	4·1	437·42	498·65	21 17 5
Sumatra ..	290	41¼	9,232	4·6	431·49	491·89	21 11 6
Egypta	327	46¾	10,646	3·9	418·55	477·14	20 18 6
Mexicana ..	282	40¼	8,641	4·6	399·75	455·71	19 19 9
Europa	347	49½	8,765	4·4	387·11	441·30	19 7 1
Goldleaf ..	362	51¾	8,415	4·4	377·67	430·54	18 17 8
Phillipina ..	284	40½	6,829	5·0	343·33	391·39	17 3 4
Yuelta	239	34	7,560	4·4	338·28	385·64	16 18 3
Connecticut ..	259	36¾	6,878	4·7	325·48	371·04	16 5 6
Turka	270	39¾	6,395	4·9	316·07	360·31	15 16 0†
Ardath	332	47½	6,261	4·8	302·91	345·31	15 2 10
Asiana	279	39¾	5,933	4·9	292·01	332·62	14 12 0
Netherlana ..	292	41¼	6,903	4·2	291·78	332·62	14 11 9
Havana ..	325	46½	7,001	4·0	285·86	325·88	14 5 10‡
Cameo	303	43¼	5,536	5·1	285·60	325·58	14 5 7
Alpina	286	40¾	6,995	3·9	276·86	315·62	13 16 10
Atlanta	252	36	5,635	4·7	266·90	304·26	13 6 10§
Hispana ..	365	52	6,574	3·6	241·69	275·52	12 1 8
Kentucky ..	281	40	6,068	3·9	239·51	273·04	11 19 6‡
India	244	34¾	4,578	4·9	225·30	252·75	11 5 3
Averages of herd of 26 cows ..	308	43¾	8,084½	4·6	374·03	426·39	18 14 0‖

* Milk at 8d. a gallon, £49 18s. 1d.

† Was sick a few days.

‡ Suffered from lameness.

§ Sold when yielding 16 lbs. milk daily.

‖ Milk at 8d. a gallon, £26 18s. 11d.

Season 1914-15.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Pipio	334	47¾	6,802	4·8	326·37	372·06	16 6 4
Tennessee ..	311	44½	6,706	4·2	282·88	322·48	14 2 10
Samorna ..	365	52	5,490	4·9	271·76	309·80	13 11 9
La Reina ..	342	48⅞	5,070	5·1	261·96	298·63	13 1 11*
Mongolia ..	301	43	5,799	4·2	244·95	279·24	12 4 11
Sylvia	301	43	4,897	4·7	235·79	268·80	11 15 9
Tuckahoe ..	322	46	4,374	4·7	206·38	235·27	10 6 4
Averages of herd of 7 heifers ..	325	46¼	5,591	4·6	261·44	298·04	13 7 1†

SHEEP AND WOOL TERMS.

By H. W. Ham, Sheep Expert.

Lambs.—Young sheep in their lambs' fleece, up to six months old. Speaking technically, the term "lambs" should cease to apply immediately the mother's milk fails. But ewes vary in the time they retain their milk. Favorably situated, many retain it up to six months. On cold, overstocked pastures, they often fail in twelve weeks.

Five months, however, is the average period of lactation, and the majority of lambs are shorn and become "weaners" at this age.

Woolly Lambs.—Lambs prematurely weaned, and therefore forced to live entirely on natural pasture at an early age, and found low in condition. These and older store lambs, while carrying their lambs' fleece, are known as "woolly lambs." The same lambs, though, if immediately shorn, would come under the more extended term of "weaners," apart from the fact of their age.

Shorn Lambs are usually shorn to facilitate fattening, but still sucking the mothers.

Suckers are small, prime lambs, subsisting almost entirely on the *mothers' milk, and unable to live and maintain their condition apart* from the mother.

Lambs commence nibbling at the pasture when about twenty-one days old.

Lambs is also used as a wool term describing young winter-grown wool not yet affected by summer's heat and grass seed. As a rule, this wool is exceedingly soft, free, and elastic, and outwardly carries a "tippiness" and a "pointed lock" peculiar to lambs' wool. Age alone does not decide the lamb stage.

Summer Lambs are born out of season, during summer, after general shearing time. They carry a fleece showing the "lambs' tip" more or less affected by summer heat, seeds, &c. It lacks the necessary length of staple to be classed as "hogget wool." If these lambs are shorn at any time, and weaned, they would be known as "weaners."

Weaners.—Young, shorn sheep, separated from and able to subsist apart from the mother.

This term has a wide application. Owing to various breeds and varieties of climate, lambing occurs over wide areas from early autumn, with merino sheep, to spring time, in British breeds. When conditions are unfavorable, ewes only retain their milk up to three months; thus the weaner stage often commences from as young as twelve weeks, and continues up to the time of fully developing their two permanent teeth, usually at about one year and three months.

Considering the comparatively adverse conditions often following on weaning time in most parts of Australia, young sheep thrive better when relieved of whatever fleece they may have at the time of separating them from the ewes, usually during the closing week of shearing. This fact of being shorn is the main distinction between "weaners" and "hoggets."

A weaner fleece has a shorn tip, and consequently, when well treated, a level "blocky tip," each fibre being of the same length.

Although not always possessing the length of staple found in hogget wool, it is superior in every other detail, being, as a rule, sounder, of better combing qualities, and more free from seeds and burrs.

Weaners produce the most superior wool grown.

As explained under Hoggets, the custom has been growing, in cataloguing wool, to use the H (hoggets) to denote the contents of the bale to be from young sheep of the second shearing. W would indicate wethers.

Hoggets.—Young sheep born at, or prior to, one shearing, not shorn, and carrying their fleece until the next.

In a literal sense, all young sheep on leaving the mother's milk are weaners, but "weaners" are not "hoggets."

The term "hogget" is really a wool term, indicating a bulky fleece of fifteen to eighteen months' growth of wool, of exceptional length of staple in proportion to its degree of fineness.

If it were not for these peculiarities of fleece, "hoggets" could come under the term "weaners" also.

In wool catalogues the letter H (hoggets) is used often in describing all young wool, excepting "lambs'."

For instance, E H (ewe hoggets) denotes sex and age. It is not taken that the bales necessarily contain hogget wool, although they may do so. It is more often found weaner wool, but the letter W has been always used to indicate wethers as 4 and 6 T. W. (two and three-year-old wethers), and the H is therefore used to cover weaners, hoggets, and summer lambs.

Hogget fleeces show a rather wasty tip, as compared to weaner fleeces, due party to the lamb's tip not having been shorn, but mainly to having passed through summer with the extra length of staple.

The production of this class of wool has decreased greatly of late years. Only small parcels are now occasionally found among crossbred wools.

In the past the demand for wools of extra length, fine wools especially, induced many Merino breeders to produce this class of wool. But from time to time several disadvantages manifested themselves. When weaned, these hoggets commenced the summer with a fleece which soon became, in good grass years, a collection of seeds and burrs. The fleece became a burden and torment during summer, and a very heavy tax on travelling to and from water and feed in dry autumns. Frame development became checked, and the staple consequently often found unsound at shearing time. The extra price for the fleece even then never compensated for these disadvantages, and as more length and "shaftiness" gradually became bred into Merino sheep in general, hogget wool became more and more neglected by manufacturers, and the custom to leave lambs unshorn has gradually been discontinued.

"Two Tooths," "2 Tooths," "2 T's."—Young sheep showing their first two permanent teeth, fully developed, usually at about one year and three months old.

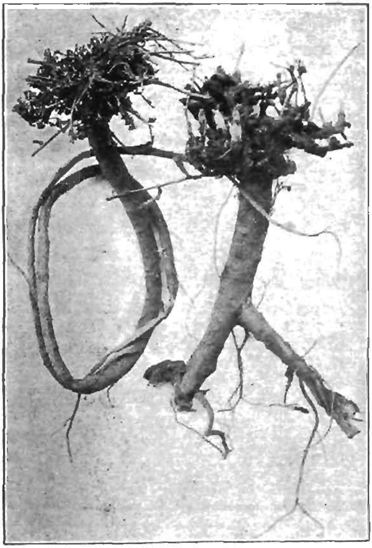
Breed of sheep, months of year lambed, varying seasons, varieties of pasture, &c., all cause more or less variation in the time at which the two first permanent teeth appear, and to some extent the other teeth.

AN INSECT PEST OF LUCERNE.

Cockschafer Grubs (*Heteronyx piceus, Blanch.*)

By C. French, Jun., Government Entomologist.

During the last few months, many lucerne-growers at Werribee have suffered considerable losses by the depredations of insect pests. On making an inspection of the affected areas, I found that in many instances, the plants were dying out, owing to the leaves having been



Lucerne Plants showing Damage caused by Cockschafer (*Heteronyx*) Larvae.

practically eaten away. Close to each plant, 1 or 2 inches below the surface, numbers of cockschafer grubs were found. These were of a dirty white colour, and measured from ¾ to an inch long. In one spadeful of earth, nearly two dozen grubs were observed. The surface

of the ground, where the grubs were plentiful, was perforated with thousands of holes, nearly all containing the insects.

The grubs live on the roots of native and other grasses. They seem to confine themselves to particular patches of the soil, usually where manure has been rather plentifully used. The perfect insect is of a light-brown colour, shining, and measures ½-inch long by ¼-inch wide. The female is usually larger than the male. When the perfect insects leave the soil, usually in the hottest months, they are to be seen towards dusk swarming around the tops of the eucalyptus trees, and when a strong wind is blowing, they are often blown out to sea and destroyed. Last season, at many places along the coast, they were to be seen in thousands washed up along the beaches, having been blown out to sea and then washed up by the tide.

The damage done at Werribee this year was, no doubt, caused by the beetles being blown from grass-lands in the vicinity. The exceptionally dry season was also favorable to the spread of these insects; in very wet seasons many of the grubs are destroyed by a fungus disease.

When a lucerne crop is badly affected with these grubs, it is advisable to have it cross scarified, if practicable, harrowed and then rolled. A small lucerne patch growing at the Research Farm at Werribee was

Larvae of Cockschafer.

Perfect Insects.

attacked by the grubs. The above-named methods were used, and the results were very satisfactory; the plants are now throwing out new foliage. Keeping the ground continually worked is absolutely necessary, as it exposes the grubs to the birds. When some of the lucerne crops were being harrowed lately the seagulls (Jamieson's Silver Gull) came day after day and gorged themselves with the grubs. Other insectivorous birds, such as robins, magpies, plovers, &c., which are fairly numerous on the Werribee farms, are ever on the watch for the grubs that are turned up.

Reports have recently come to hand of the grubs attacking wheat. The trouble is generally in patches. They eat out a small space, measuring usually only a few yards in circumference, and then start on another one. They feed on the roots of plants, and sometimes come up and destroy the foliage when the crops are a few inches or so in height.

As a remedy, I would suggest cutting up lucerne, grasses, succulent weeds, &c., into small pieces, and dipping them into arsenate of lead

(1 lb. to 30 gallons of water). These poisoned baits could then be spread over the affected area. As a precaution, cattle should be kept from the fields where the baits are scattered. A plan which has given good results is to water the plants, if only small patches are affected, with arsenate of lead. If the crops are completely eaten out, it would be advisable to adopt the means recommended for destroying the grubs in lucerne crops.

Some species of Heteronyx cluster on the tops of the eucalyptus trees, often stripping them of every young leaf.

FARM-YARD MANURE.

By R. T. McKenzie, Dairy Supervisor.

It is a notorious fact that many farmers under-estimate the value of farm-yard manure, with the result that much valuable fertilizing material goes to waste every year on the farms of this State. It is no uncommon sight to see great heaps of manure, the accumulation of many years, lying about, without any attempt made to put same to profitable use. In fact, in some cases it is looked upon as a nuisance, the farmer being content with getting it away from the proximity of his milking sheds and other places. In cases where farmers do make an endeavour to utilize the farm-yard manure, their efforts are, to a large extent, neutralized by faulty methods of storage. They are, for the most part, ignorant of the fundamental bacterial changes which manure undergoes subsequent to being voided by the animal. It is in extremely rare cases that any attempt is made to save the liquid manure; yet this is by far the more valuable of the two, as analyses from American sources indicate, viz.:—

	Nitrogen.	Phosphoric acid.	Potash.
Solid horse manure contains ..	.495 ..	.13 ..	.200
Liquid horse manure contains ..	1.20 ..	trace ..	1.24
Solid cow manure contains ..	.324 ..	.09 ..	.124
Liquid cow manure contains ..	.95 ..	.013 ..	.79

The above table demonstrates that the liquid excrement is much richer in plant food than the solid, consequently every effort should be made to retain it. Once, farm-yard manure was practically the only manure used; this was prior to the advent of the artificial fertilizer, which is applied in a way that is easily assimilated by the soil, and makes its effect immediately apparent. But with farm-yard and organic manure it is not until they are decomposed that the beneficent results are manifested.

The great advantage that organic manure has over artificial fertilizers is that, besides furnishing plant food, it improves the physical, chemical, and biological nature of the soil, by increasing the humus. It is this

humus in the soil which has the faculty of absorbing water quickly and arresting evaporation, makes the soil in which humus is abundant more retentive to moisture. Humus in soil can be increased by the addition of farm-yard and other organic manure, hence the importance of the proper care and use of farm-yard manure. The primary factor to be considered in storage of manure is the control of fermentation, which causes the decomposition.

There are two processes of fermentation, namely, that caused by aerobic bacteria, which cannot live or have their being without access to the air, and anaerobic bacteria, which flourish and develop only when atmospheric air is excluded. It is the first class of bacteria that cause the extreme heat, which is very undesirable, inasmuch as the heat liberates the nitrogen, the most valuable element. It also incidentally destroys the humic acid. The conditions favorable for the development of aerobic germs are when the manure is loose and contains little moisture. Anaerobic fermentation, on the other hand, is carried on best when the manure is compacted and moist, thereby preventing the incursion of air, so that decomposition is carried on without any great heat, thus preventing the loss of nitrogen and humic acid. It is obvious, therefore, that the farmer should store manure in such a way as to prevent aerobic, and encourage anaerobic fermentation.

This cannot be done under the present haphazard fashion of piling manure. A good method of storing manure is to build a brick or concrete pit of sufficient size to meet the requirements of the farm, making provision for the catchment of the liquids.

Another inexpensive method is to make a compost heap, where the manure is spread in layers until the needed size is reached, a few inches of soil being thrown on to exclude the air. Provision should be made for the catchment and return of the seepage water to the heap.

Another good method, where practicable, is to apply the manure in a fresh condition straight from the stable or byre, spread in narrow strips, which should be ploughed in about once a fortnight.

If farm-yard manure is conserved in some such way, it will be of much greater value than when allowed to accumulate in the present loose fashion.

The cow and the acre are the twins of the dairy farm, and must both be treated fairly. Both must earn their keep. Each helps the other when properly trained together. If one is poor it robs the other.—*Hoard's Dairyman.*

Testing the best cows in a herd has value only to breeders selling stock as an advertisement, but testing the whole herd is of the greatest value to all dairymen as an economical proposition; there are greater differences between the yield of individual cows of the same breed than between the average yield of different breeds.—*Hansen's Dairy Bulletin.*

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

CONCLUSION OF WINTER TEST.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.7.15	15.7.15 to 14.8.15	Four months.	Position in Competition.
		LIGHT BREEDS. WET MASH.				
21	White Leghorns ..	E. B. Harris	367	144	511	1
53	" ..	W. G. Swift	373	132	505	2
38	" ..	G. McDonnell	364	139	503	3
2	" ..	E. A. Lawson	368	122	490	4
19	" ..	L. G. Broadbent .	388	101	489	5
5	" ..	J. J. West	352	132	484	6
34	" ..	H. McKenzie and Son ..	341	131	472	7
8	" ..	*C. J. Jackson*	350	117	467	8
9	" ..	J. Schwabb	345	117	462	9
10	" .	A. E. Tuttleby	332	129	461	10
6	" ..	F. Doldissen	341	119	460	11
7	" ..	Marville Poultry Farm ..	345	114	459	12
16	" ..	N. Burston	320	136	456	13
42	" ..	W. M. Bayles	346	110	456	
18	" ..	D. Adams	326	118	444	15
26	" ..	A. Mowatt	314	127	441	16
44	" ..	Mrs. F. M. Oliver ..	313	120	433	17
4	" ..	R. Hay	305	118	423	18
32	" ..	F. Hodges	299	120	419	19
60	" ..	H. C. Brock	289	129	418	20
25	" (5 birds)	Giddy and Son	307	108	415	21
30	" ..	*A. E. Silbereisen* ..	328	82	410	22
50	" ..	John Hood	281	122	413	23
1	" ..	Mrs. H. Stevenson ..	283	119	402	24
39	" ..	W. M. Sewell	279	117	396	25
49	" ..	Bennett and Chapman ..	280	112	392	26
11	" ..	*J. B. Brigden*	268	122	390	27
24	" ..	Lysbeth Poultry Farm ..	261	126	389	28
3	" ..	J. H. Gill	284	102	386	29
51	" (5 birds)	A. H. Mould	279	102	381	30
33	" (5 birds)	A. W. Hall	266	113	379	31
28	" ..	R. Lethbridge	288	90	378	32
15	" ..	H. N. H. Mirams ..	269	109	378	
54	" ..	W. G. Clingin	253	121	374	34
13	" ..	T. Hustler	258	114	372	35
23	" ..	Fulham Park	264	108	372	
59	" ..	W. G. Osburne	250	121	371	37
48	" ..	C. J. Beatty	243	121	364	38
57	" ..	B. Mitchell	268	92	360	39
55	" ..	W. N. O'Mullane ..	244	110	354	40
52	" ..	*A. A. Sandland*	285	64	349	41
43	" ..	H. I. Merrick	257	79	336	42
47	" ..	J. C. Armstrong ..	227	104	331	43
20	" ..	R. W. Pope	216	105	321	44
36	" ..	Weldon Poultry Yards ..	254	65	319	45
45	" ..	South Yan Yean Poultry Farm	218	100	318	46
41	" ..	J. A. Donaldson ..	197	118	315	47
40	" ..	C. C. Dunn ..	253	61	314	48
58	" ..	Thirkell and Smith ..	201	112	313	49
27	" ..	J. A. Stahl	193	114	307	50
14	" ..	W. Flood	234	71	305	51
12	" ..	G. Hayman	204	101	305	
46	" ..	R. Berry	190	110	300	53
22	" ..	*S. Buscumb*	198	82	280	54
37	" ..	A. Ross	167	110	277	55
56	" (5 birds)	C. Hurst	168	91	259	56
31	" ..	L. McLean	103	93	196	57
		Total	15,798	6,266	22,064	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.7.15.	15.7.15 to 14.8.15.	Four months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	424	137	561	1
69	" ..	E. MacBrown	332	118	450	2
78	" ..	H. Handbury	310	119	429	3
68	" ..	H. McKenzie and Son ..	316	107	423	4
64	" ..	W. M. Bayles	316	103	419	5
72	" ..	Mrs. E. Zimmerman ..	297	97	394	6
79	" ..	*Lysbeth Poultry Farm* ..	294	99	393	7
66	" ..	E. A. Lawson	280	96	376	8
76	" ..	A. A. Sandland	253	110	363	0
63	" ..	A. H. Padman	201	148	349	10
65	" ..	Thirkell and Smith ..	230	109	339	11
71	" ..	Moritz Bros.	247	73	320	12
67	" ..	C. C. Dunn	229	82	318	13
62	" ..	*Benwerren Egg Farm* ..	194	119	313	14
61	" ..	Mrs. H. Stevenson ..	162	139	301	15
74	" ..	J. H. Gill	130	110	240	16
75	" ..	Fulham Park	156	81	237	17
77	" ..	South Yan Yean Poultry Farm	1.9	109	218	18
73	" ..	C. L. Lindrea	75	125	200	19
		Total	4,555	2,087	6,642	
		HEAVY BREEDS.				
		WET MASH.				
100	Black Orpingtons ..	J. H. Wright	398	126	524	1
81	" ..	Mrs. T. W. Pearce ..	402	113	515	2
97	" ..	Marville Poultry Farm ..	361	146	507	3
86	" ..	C. E. Graham	334	142	476	4
90	" *(5 birds)*	*Oaklands Poultry Farm* ..	331	124	455	5
94	" (5 birds)	D. Fisher	340	110	450	6
85	" ..	H. H. Pump	326	119	445	7
88	" ..	J. McAllan	294	126	420	8
89	Rhode Island Reds	E. W. Hippe	291	122	413	9
99	Black Orpingtons ..	L. McLean	281	111	392	10
87	" ..	W. C. Spencer	285	105	390	} 11
93	" ..	*L. W. Parker*	233	157	390	}
91	" ..	A. Greenhalgh	281	85	366	13
84	" ..	Cowan Bros.	241	111	352	14
95	Silver Wyandottes ..	W. H. Forsyth	249	102	351	15
96	White Orpingtons ..	Stranks Bros.	269	80	349	16
92	Black Orpingtons ..	J. Ogden	169	139	308	17
83	" ..	G. Mayberry	192	80	272	18
98	Faverolles ..	K. Courtenay	117	109	226	19
82	White Wyandottes	J. B. Brigden	14	90	104	20
		Total	5,408	2,297	7,705	

Report for Month Ending 14th August, 1915.

The weather conditions for the month were seasonable. There was much north-west wind, with light rains, and an occasional clear day. Temperatures ranged from 30 deg. in the early morning to 62 deg. at 2 p.m. There has been an entire absence of illness amongst the birds this month. Some Leghorns are still moulting, but generally the birds are hard and doing well. Three pens of heavy breeds were successful in passing the world's record winter test for heavy breeds, which stood at 502. Mr. J. H. Wright's pen finished with 524, Mrs. T. W. Pearce's 515, and Marville Poultry Farm 507. Mr. Robbins' Leghorns failed by four eggs to reach the world's record put up by Mr. Gill's pen last year. One of Mr. Robbins' pullets took ill on 3rd July, and was 35 days before returning to lay. The average for the month is again well ahead of that of last year. The

ORCHARD AND GARDEN NOTES.

Ed. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

The winter seasonable works, such as pruning and planting, with the exception of citrus fruits in the latter case, will now be completed; and the time has arrived for the new season's work to be commenced.

The spring ploughing should now be proceeded with as early as possible, so as to conserve all soil moisture. If the ploughing be delayed, it frequently happens that, owing to dry weather setting in, the soil surface becomes hardened and compacted, and in that condition it is very difficult to turn over. Cultivation should quickly follow ploughing, so that there shall be no lumps or clods on the surface. Where it is intended to use stable manure, or to spread fresh soil in the orchard, this should be done before ploughing, so that it may be well ploughed under.

As soon as cover crops are in full flower, they should also be ploughed in.

If the soil be warm, citrus trees of all descriptions may be planted, the ground having been previously prepared for their reception. The planting of these trees may be spread over September and October, and in cooler districts they may be left until November.

Spraying.

Peach aphis will be making its appearance on peach, nectarine, and Japanese plum trees, if it has not already done so. As soon as it appears frequent sprayings with a nicotine solution will be required to keep it in check. It is advisable to spray early, and to spray a second time a few hours after the first spraying has been completed. After the first spraying the aphides that remain alive generally endeavour to find a more congenial position. These moving ones, as well as the weakened ones, are then readily dealt with by the second application. Red oil emulsion should not be used, as this is only a winter spray.

As soon as the flower buds of the apple and pear are opening, these trees should be sprayed with Bordeaux mixture for black spot. Peach and nectarine trees will need a Bordeaux spraying for leaf curl, and plum trees also, for plum or prune rust.

In spraying peach trees for peach aphis and leaf curl, or for aphis and prune rust, the tobacco solution and Bordeaux mixture may be safely used as a mixture without any fear of damage to the trees.

In some cases the copper-soda spray is preferred by orchardists, in lieu of Bordeaux mixture. It is certainly good in many instances, and where fresh lime is not procurable, or where the climate is dry, the copper-soda mixture is useful as a fungicide. It is, however, not so adhesive as Bordeaux, and is readily washed off by rain or heavy dews. The copper-soda mixture should not be used on stone fruits, particularly peaches, as the foliage of these is too delicate for the use of this spray. The recognised formulæ are—

Bordeaux: 6 lbs. bluestone, 4 lbs. fresh lime, and 50 gallons of water.

Copper-soda: 6 lbs. bluestone, 8 lbs. washing soda, and 50 gallons of water.

If the winter spraying for the Byrobia mite has been neglected, the trees should be given a good spraying with a nicotine solution or with pine spray, soaperine, or other similar preparation.

GRAFTING.

The work of grafting should be completed early in the month. The most useful method of re-working old trees is to cut the head right away, leaving only the stump. Then grafts can be put in according to the fancy of the grower. The old method of cleft grafting has been superseded by the bark or crown graft. The latter method does not cause any damage to the wood, and thus, with care, no rotting can take place. The best method of bark grafting is the saddle graft; that is, the graft is inserted in the bark, and a strip of bark is carried right across the trunk and inserted in the bark on the opposite side. This method is much slower than the ordinary bark graft, but it insures a much quicker healing over of the old stump.

THRIPS.

The thrips pest caused very considerable loss of all classes of fruit last season, and fruit-growers are inquiring as to the possibility of another invasion this year. It is practically impossible to forecast insect visitations, but it is well known that in a dry spring there is always the possibility of a great increase of this pest. The facts that the past winter has been fairly uniformly wet and also that up to the present time no thrips can be detected in the early blossoms would point to a reduction of the pest this year. The thrips is one of the pests that must be prevented from coming, as it is too late to take any action when the pest appears. It was found in several localities last year that, where the trees had been well sprayed with red oil in the winter time, this pest was not in evidence to any extent on the sprayed trees, and when it did appear, it had evidently spread from unsprayed trees.

Experiments in California have shown that the thrips were well controlled by spraying with Distillate Oil Emulsion and with nicotine solution. The nicotine solution used was the American preparation known as Black Leaf 40, and it was sprayed at the time of flowering. The best results were obtained from a combination of these two sprays at a time when the buds were just loosening their scales preparatory to bursting. This seems to be the critical time, as the larvæ are just hatching from the eggs, and naturally they are very weak.

In the absence of Distillate Oil Emulsion, which is not yet procurable in Australia, some of the following remedies may be tried:—Lime sulphur, nicotine, benzole emulsion, soaperine, or pine spray.

A series of experiments is now being carried out at the Burnley Gardens, by means of which it is hoped to obtain data which will assist in keeping this pest in control.

The Vegetable Garden.

Frequent cultivation will be necessary this month, especially after waterings.

Wherever such pests as tomato weevil, cabbage moth, cabbage aphis, cut worms, &c., were prevalent in the soil last season, it would be advisable, before planting, to give the beds a dressing of such substances as

will tend to reduce or eradicate them. These preparations include lime, pestend, tobacco dust, and manurial insecticide.

Any seedlings that are ready may be planted out; tomato plants may be planted out under shelter until the frosts are over. At the end of the month a sowing of French bean seeds may be made. Seeds of peas, broad beans, beet, cabbage, kohl rabi, radish, turnip, cauliflower, lettuce, carrot, parsnip, &c., may be sown in the open. Seeds of melons, cucumbers, pumpkins, marrows, and similar plants may be planted in frames for transplanting after the frosts have gone.

The Flower Garden.

Ordinary garden work this month includes frequent and constant cultivation of the beds. The hoe should be kept busily employed to prevent surface caking. The soil will be surcharged with moisture after the rains, and if this be conserved by regular hoeing, much summer watering will be avoided. The hoeing will also kill all weeds, which is a necessity.

Wherever it appears, the rose aphis will require to be checked by spraying with some nicotine or soapy solution. As soon as any aphides are noticed they should be sprayed, and when the plants have all been sprayed, they should be gone over a second time, on the same day if possible, so as to do the work thoroughly.

For rose scale the lime-sulphur spray be used to clean the old stems, but the spray should not touch the young growths or buds.

Roses may now be disbudded of their superfluous growths, by removing all crowded or badly-placed shoots.

A watch should be kept for mildew, which should be dusted with sulphur as soon as it appears. It is also a good plan to dust some sulphur on the soil, so that the fumes may also act on the fungus.

Chrysanthemums, cannas, and other herbaceous plants may be planted out, dividing the clumps into small sections; gladioli, dahlias, for early flowers, seedlings, and seeds of tender annuals may also be planted.

REMINDERS FOR OCTOBER.

LIVE STOCK.

Horses.—Continue to feed stabled horses well, add a ration of green-stuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old or badly-conditioned horses liberally. If too fat, mares due to foal shortly should be put on poorer pasture. Mares with foals at foot should receive a good ration of oats daily. Those intended for breeding, if not already stinted, should be put to the horse. Colts not intended to be kept as stallions should be gelded. Working horses due for a spell should be turned out to grass.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a warm dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they

Pigs.—Supply plenty of bedding in warm well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. *Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible.* Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Shear early where weather will permit. This will allow sheep to commence a better fleece and recover in condition from past season. Shear *lambs not to go for export at once, and avoid grass seeds.* Avoid undue dust in yarding for shearing. Well-bred fleeces free from dust and burr should be skirted carefully, the better the class of wool the greater the need. Fleeces dry and earthy on the backs need only stains removing; there is little advantage in removing burr on these. It is better management to have ample table room, and the extra hands skirting carefully than to hastily tear off unnecessary wool and then employ men at the piece table to sort "broken fleece" and "first pieces." *All ewe stains must be removed and wether stains from bellies.* Separate all coarse fleeces from the finer sorts, and in merinoes the yellow and mushy ones from the shafty and bright. Skirt all hairy thighs from crossbred fleeces. Press in neat bales, not "sew-downs." Brand neatly and not with sheep branding oil or paint. Stencil plates and branding ink will be supplied by brokers *if requested to do so.*

Poultry.—The bulk of incubation should cease this month—late chickens *are not profitable. Devote attention to the chickens already hatched; avoid* overcrowding. Feed with dry mash. Also add plenty of green food to ration, ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize, and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as *possible; tainted ground will retard development.*

CULTIVATION.

Farm.—Plant main crops of potatoes in early districts and prepare land for main crop in late districts. Fallow and work early fallow. Sow maize and millets where frosts are not late, also mangolds, beet, carrots, and turnips. Sow tobacco beds and keep covered with straw or hessian.

Orchard.—*Ploughing and cultivating to be continued, bringing surface to* a good tilth, and suppressing all weeds. Spray with nicotine solution for peach aphis, with Bordeaux mixture for black spot of apple and pear, and with arsenate of lead for codlin moth in early districts.

Vegetable Garden.—Sow seeds of carrot, turnip, parsnip, cabbage, peas, French beans, tomato, celery, radish, marrow, and pumpkins. Plant out seedlings from former sowings. Keep the surface well pulverized.

Flower Garden.—*Keep the weeds down and the soil open by continued hoe-*ing. Plant out delphiniums, chrysanthemums, salvia, early dahlias, &c. Prepare ground for digging and manuring for autumn dahlias. Plant gladioli tubers and seeds of tender annuals. Spray roses for aphis and mildew.

Vineyard.—This is the best month for field grafting. If stocks bleed too copiously, cut off 24 hours before grafting. Make sure that scions are fresh. Placing butts in clean water for a few days before grafting is recommended. *Field grafts must be staked, to avoid subsequent straining by wind and to insure* straight stem for future vine. Stakes are also necessary for grafted rootlings for same reasons. Temporary stakes 3 feet long will suffice. Keep a sharp look out for cut worms. (See *Journal* for July, 1911, and also October, 1913.) Disbud and tie up all vines, giving special care to young plantations. Beware of spring frosts. (See *Journal* for September, 1910.)

Conclude spring cultivation (second ploughing or scarifying and digging or *hoeing round vines). Weeds must be mastered and whole surface got into good* tilth. Sulphur vines when shoots 4 to 6 inches long.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

/ol. XIII. Part 10. 11th October, 1915.

)RY-FARMING INVESTIGATIONS IN THE UNITED STATES.

By Lyman J. Briggs, M.S., Ph.D.

n charge of Biophysical Investigations, United States Department of Agriculture.

Presented before Section M of the British Association for the Advancement of Science, Melbourne, Australia 1914.

(Continued from page 455.)

Influence of the Distribution of Rainfall on Farm Practice.

The different distribution of the rainfall in the inter-mountain listrict and in the Great Plains, has led to interesting differences in the arm practice of these regions.

Spring wheat is not a successful crop in the inter-mountain district, or two reasons: (1) The land cannot be fitted for sowing until late in he season, owing to the spring rains; and (2) the driest part of the eason occurs when the spring wheat crop is maturing. A large acreage f winter wheat is, however, grown. In fact, the dry-farming activities f this section are devoted almost wholly to the growing of winter wheat. 'he stubble is not usually ploughed until spring, the land being very ry and hard in the fall. The stubble also keeps the winter snows from rifting, and thus holds the precipitation on the land. As soon as the pring rains have ceased, the stubble and the early growth of weeds are urned under, and the land is kept fallow until the following autumn. 'he low rainfall during the summer makes it possible to destroy the reed-growth, and maintain an efficient surface-mulch, at a comparaively low cost. In the autumn, wheat is again sown. The crop makes

a good part of its growth while the temperature is cool and the evaporation low, and, in addition to the stored moisture, has the advantage of the seasonal precipitation during its growth period.

One serious difficulty in dry-farming operations in regions of winter rainfull occurs in connexion with the seeding of winter wheat on fallow land. The surface mulch of the fallow is often dust-dry in the fall to a depth of 4 inches or more. If the farmer drills his grain in the dust, the seed remains inert until a rain occurs. If the first rain is insufficient in amount to soak through the dry mulch to the damp soil below, the seeds germinate, but the rootlets of the seedling plants do not reach the stored moisture below the intervening dry layer, and the plants soon die. On this account, farmers usually wait for fall rains before sowing wheat. If the seeding is thereby delayed until late in the fall, and freezing weather follows, the young plants are injured and weakened. And if this is followed by an "open winter," so that the wheat plants are not protected by a covering of snow, "winter killing" is often very severe, and the crop is practically a failure.

Drilling the wheat to a depth sufficient to place the seed in moist soil would appear to be a possible solution of this problem, but this is often found impracticable, and the seedling plants have great difficulty in forcing their leaves to the surface. It is possible that a solution of the difficulty may be found in a seed-drill which has recently been developed, which throws the dry surface soil in ridges, and plants the grain in moist soil at moderate depths in the intervening furrows. This plan is not practicable in windy regions, for the furrows would soon fill with dry soil.

In striking contrast with inter-mountain practice, spring-wheat is grown extensively in the Great Plains, especially in the central and northern part. The spring-sown crop escapes the dry fall and all danger from winter-killing, while the land, having been recently worked, is in better condition to absorb the summer rainfall. Inter-tilled crops are also grown to a much greater extent than in the inter-mountain district, maize being especially popular in the northern part of the Great Plains, and the sorghums (milo, kafir, sorgo) in the southern part. The inter-tilled crop has in many sections largely taken the place of fallow, spring wheat now being extensively grown on disked corn land.

Fallow is used extensively in the Great Plains, but experiments by the Office of Dry Land Agriculture, under the direction of E. C. Chilcott,* have shown that alternate cropping and summer tillage in many sections is less profitable than simple three-year rotations, especially those in which spring wheat is grown on disked corn land, and even less profitable than continuous cropping. Summer tillage is not so well adapted to a summer rainfall as to a winter precipitation, for the summer rains repeatedly pack the mulch, which necessitates frequent cultivation to keep the land in a receptive condition, and to destroy the weeds which spring up after each rain. Summer tillage, however, affords some insurance against total loss of a crop during a dry season, which means disaster to the farmer with work-animals and cows to feed; and this element of insurance will doubtless always be a factor with the small farmer, even if summer tillage does not give the greatest returns.

* A study of crop rotations and cultivation methods for the Great Plains area.—United States Department of Agriculture, Bureau of Plant Industry, Bulletin 187, page 8, 1910.

Owing to the frequent high winds in the Plains, the blowing of the mulch on summer-tilled land sometimes becomes a serious problem. It is highly important, in fallowing the Plains, to keep the surface of the soil in a rough condition; in other words, to maintain a clod-mulch on the fallow rather than a dust-mulch, a practice which is also advantageous in the absorption of rainfall. On lands subject to blowing, the practice of cultivating in strips is sometimes followed. The strips are laid out at right angles to the prevailing winds, and alternating strips are planted to grain or an inter-tilled crop. Jardine* has recently emphasized the value of the lister in checking blowing in extreme cases. This implement opens a broad shallow furrow, throwing the dirt on both sides. Groups of two or three furrows each are listed at distance of from 5 to 20 rods across the field at right angles to the wind. The lister tends to form clods, while the disk-harrow, except in moist ground, tends to pulverize the soil, and this must always be avoided in soils subject to blowing.

Depth of Root System in Relation to Storage of Soil Moisture.

The great depth to which the roots of many of our cultivated plants extend has a very important bearing on the practicability of storing moisture in the soil. Burr† has found that oats, spring wheat, barley, and corn growing on the loose soils of eastern Nebraska use the water to a depth of 4 feet or more, while winter wheat feeds to a depth of 6 or 7 feet. Excavations made in winter wheat plots in Utah showed the root system to extend to a depth of 7 feet.‡

In a soil which can store 6 per cent. of "growth water," there would be available, in a section 6 feet in depth, 600 tons of water per acre, or enough for the production of 13 bushels of wheat in the central Great Plains.§ For a root penetration of 4 feet, this amount would be reduced approximately one-third.

When the system of alternate cropping and fallowing is employed, water seldom moves below the zone occupied by the roots of the wheat plant. This has taken place, however, at the Dickinson Experimental Farm in western North Dakota. The water which moves below the feeding zone is practically lost to the plant, and remains undisturbed from year to year. An argument often advanced in favour of deep ploughing is that the depth of root penetration is thereby increased. The futility of this argument, so far as dry-farm soils are concerned, becomes evident when it is realized that the normal penetration of roots in the inter-mountain and Great Plains soils is far below any depth that could possibly be reached with the plough. Deep ploughing may possibly increase the absorption-rate of rainfall when the precipitation-rate is so high as to saturate the surface soil temporarily; but this effect can also be secured by leaving the surface rough and corrugated when cultivating. Many of the field tests of the Office of Dry Land Agriculture have failed to show any increase in yield from deep ploughing, an operation which means an added expense to an industry in which economy in labour must be rigidly exercised to show a reasonable profit.

* *Journ. Am. Soc. Agron.* 5, 213, 1913.

† Research Bulletin No. 5, Nebraska Experiment Station, 1914.

‡ Merill.—Bulletin 112, Utah Experiment Station, 1910.

§ Briggs and Shantz. Relative water requirement of plants.—*Journal of Agricultural Research*, United States Department of Agriculture 3, 1, 1914.

Loss of Water from Weeds.

A relatively small proportion of the total annual rainfall is conserved in the fallow. The maximum quantity of stored moisture available for crop seldom exceeds 4 inches of rainfall in sections where the annual rainfall ranges from 13 to 18 inches. This low efficiency is due in part to loss from run-off, but mainly to surface evaporation, and to loss through the transpiration of weeds. Numerous measurements have shown that a rainfall of less than ½ inch does not contribute to the permanent store of moisture in the soil unless the surface soil is already wet from previous rains. If the rainfall penetrates the soil below a depth of 6 inches, its rate of loss due to evaporation is low. But if the fallow is weedy, the stored water is lost through the transpiration of the plants almost as rapidly as if the moist subsoil were freely exposed to the air. The water requirement of weeds is fully as high as some of our most valuable crop plants. For example, pigweed (*Amaranthus retroflexus*), tumble-weed (*Amaranthus graecizans*), and Russian thistle (*Salsola pestifer*), have a water requirement as high as the millets and sorghums, while sunflower (*Helianthus petiolarus*), and lamb's quarters (*Chenopodium album*) rank higher than many of the legumes.* The dry-farmer can therefore produce a valuable forage or grain crop with no greater expenditure of water per pound of dry matter than is lost through the weeds on his fallow.

Determination by W. W. Burr,† in Nebraska; R. W. Edwards‡ and J. G. Lill,‡ in Kansas; and C. B. Burmeister,‡ in Texas, all unite in showing that the evaporation loss from land from which the weeds are sliced off with a hoe is but little greater than from cultivated plats. In other words, cultivation is effective in conserving water mainly through the destruction of weeds rather than in the reduction of surface evaporation. This is well illustrated by Lill's measurements at Garden City, Kansas, as shown in Figure 3. The moisture content of the mulched plat did not differ markedly from the plat on which the weeds were kept sliced off with a sharp hoe; while the plat on which the weeds were allowed to grow was dried out to a depth of 3 feet.

A striking example of the loss of moisture from weeds is also shown in experiments by P. V. Cardon,§ at Nephi, Utah. Winter wheat was grown on four plats by the summer fallow system, one-half the plats being in wheat each year. Two plats were fall-ploughed each year, and during the following summer, one plat was cultivated to destroy the weeds, while the other was left untouched, except to clip the weeds in time to prevent the seeds maturing. In the autumn, both plats were sown to winter wheat. The experiment was conducted for four years, and during this time the yield from the cultivated plat averaged 4 bushels more per acre than from the weedy plat.

The loss of moisture in these plats as the season advanced, due to the demand made by the weeds, is illustrated in the accompanying graphs. Fig. 4. That this loss is primarily due to the weed cover, and

* Briggs and Shantz.—*Journal of Agricultural Research*, United States Department of Agricultur 3, 60, 1914.

† Research Bulletin No. 5, Nebraska Experimental Station, page 61, 1914. In co-operation with the Office of Dry Land Agriculture and Biophysical Investigations.

‡ Office of Dry Land Agriculture in co-operation with the Office of Biophysical Investigations.

§ *Office of Cereal Investigations in co-operation with the Office of Biophysical Investigations. See* Tillage and rotation experiments at the Nephi Sub-station, Utah, United States Department of Agriculture, Bulletin 157, 1914.

not to direct evaporation, is supported by the fact that in other experiments at this station, spring-ploughed, uncultivated fallow on which the weed-growth was slight was practically as effective as cultivated fallow

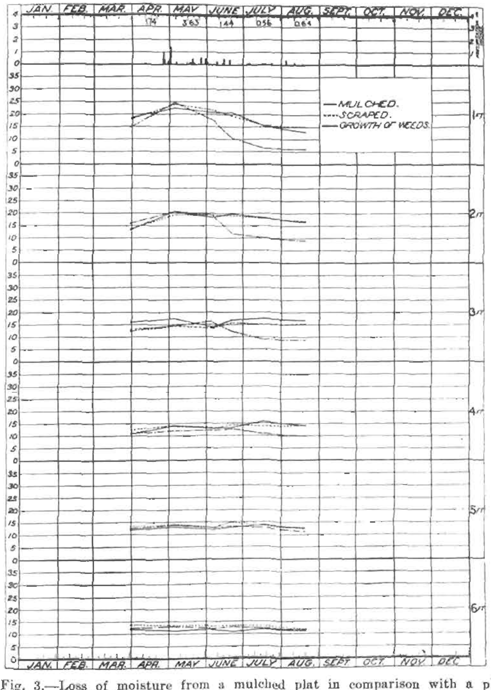


Fig. 3.—Loss of moisture from a mulched plat in comparison with a plat the surface of which has been scraped with a hoe to cut the weeds, and with a plat on which the weeds are allowed to grow. *It will be seen that the mulched* plat and the scraped plat differ little in effectiveness in conserving water, while the weeds reduce the moisture content to a depth of 3 feet.

in conserving moisture. The average moisture content (6 feet in depth) of the weedy Nephi plat was, at the time of the spring sampling, 0.8 per cent. below the cultivated plat; and at the time of the fall sampling,

4.5 per cent. below the cultivated plat. This loss in moisture during the summer is equivalent to 3.5 inches of rainfall *stored in the soil* This amount of water is sufficient, according to the water-requirement

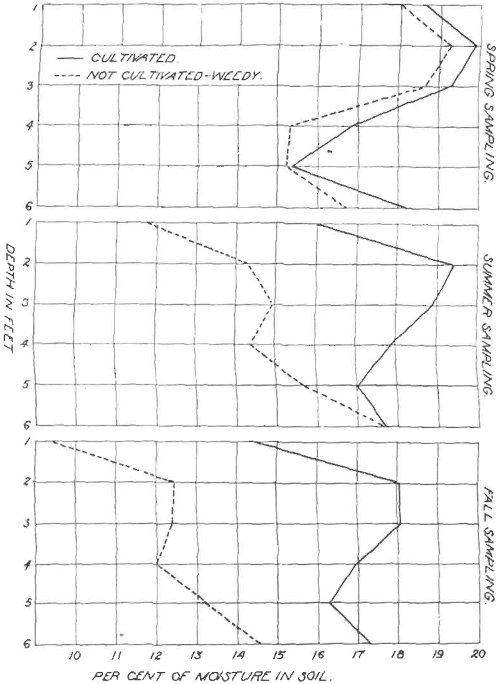


Fig. 4.—Loss of water from cultivated and weedy plats at Nephi, Utah, as the season advances.

measurements of Briggs and Shantz*, to produce 10 bushels of wheat per acre at Akron, Colorado, where the evaporation is the same as at Nephi. In 1911, the actual increase in yield of the cultivated plat

* Briggs, L. J., and Shantz, H. L. Relative water requirement of plants.—*Journal of Agricultural Research*, United States Department of Agriculture, 3, 1, 1914.

over the weedy plat was 11 bushels per acre. During the other years, the yield was reduced by winter-killing, so that the water supply was not the primary factor in determining production. Surely no more convincing proof is needed of the necessity of keeping fallow land free from weeds in regions where the moisture supply is of primary importance!

Growth-water.

It has long been known that a part of the soil moisture is held so tenaciously that it is not available for the growth of plants. Sachs, in 1859, appears to have been the first to recognise that the percentage of non-available moisture varies greatly with the type of soil. This is a matter of fundamental importance in the interpretation of soil-moisture observations, for the water unavailable for growth ranges from 1 per cent. or less in sand, to 30 per cent. or more in the heaviest types of clay.† Obviously, then, the percentage of water in the soil that is available for the growth of plants, or the "growth-water," as Fuller‡ has termed it, cannot be determined until this unavailable residue is known.

Alway§ has used the hygroscopic co-efficient, *i.e.*, the percentage amount of water that a dry soil absorbs on exposure to a saturated atmosphere, to represent the unavailable portion. Briggs and Shantz‖ have measured the moisture content at which plants undergo permanent wilting when growing in a limited soil mass, protected from surface evaporation. By permanent wilting is meant a condition from which the plants cannot recover when exposed to a saturated atmosphere.¶ The percentage of moisture remaining in the soil under such conditions has been termed the "wilting co-efficient" of that particular soil, and has been found to vary slightly with the kind of plant used as an indicator. The "wilting co-efficient" in connexion with a total moisture determination provides a means for calculating the "growth-water," the latter being the surplus above the wilting co-efficient. By the aid of such determinations it is possible to calculate the amount of stored growth-water—the bank balance, so to speak, in the water account, against which the crop may draw.

It is not necessary always to measure the wilting co-efficient directly, since it can be calculated from other physical properties of soils that can be more readily measured. Thus the moisture equivalent, hygroscopic co-efficient, and mechanical composition have all been shown to bear a linear relationship to the wilting co-efficient.** Of these indirect methods, that based on the moisture equivalent†† is the most rapid and

† Briggs, L. J., and Shantz, H. L. The wilting co-efficient for different plants and its indirect determination.—United States Department of Agriculture, Bureau of Plant Industry, Bulletin 230, 1912, pages 56–59.

‡ *Botanical Gazette*, 53, page 513, 1912.

§ *Journal of Agricultural Science*, 2, 1908, page 334.

‖ Op. cit.

¶ As the plant approaches a wilted condition its transpiration is reduced. Furthermore, as soon as wilting occurs it is necessary to transfer the plant to a saturated atmosphere in order to determine whether the observed wilting is temporary or permanent. Consequently during the final stages of a wilting co-efficient determination the transpiration rate is greatly reduced.

** Briggs and Shantz. Op. cit.

†† Briggs and McLane. *Journ. Am. Soc. Agron.*, 2, 1910, page 138.

satisfactory. The latter represents the percentage of moisture remaining in the soil when brought into equilibrium with a centrifugal force 1,000 times that of gravity. The wilting co-efficient is approximately one-half the moisture equivalent.

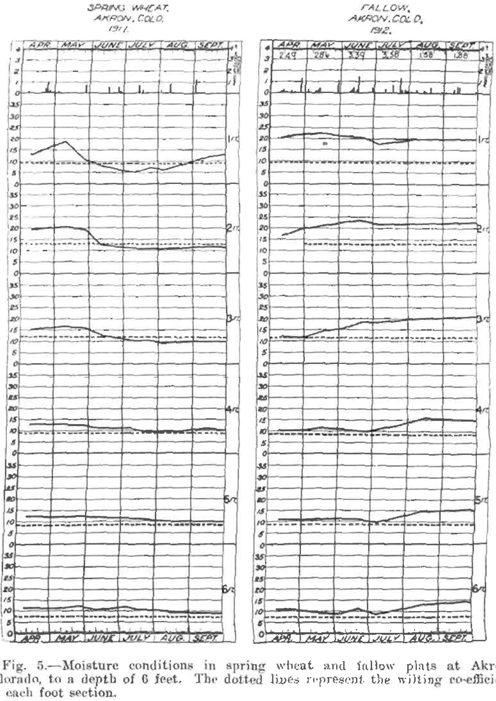


Fig. 5.—Moisture conditions in spring wheat and fallow plats at Akron, Colorado, to a depth of 6 feet. The dotted lines represent the wilting co-efficient for each foot section.

Where a small grain crop has extended its root system to a depth of 4 feet or more, the moisture content of the second and third feet is sometimes reduced below the wilting co-efficient. This is practically sure to occur if the crop is suffering for water, for plants are able to

reduce the moisture content far below the wilting co-efficient while in a wilted condition, or during the ripening process. But it appears also to take place while the crop is still growing, provided the root system is in contact with growth-water in some other part of the soil mass.*

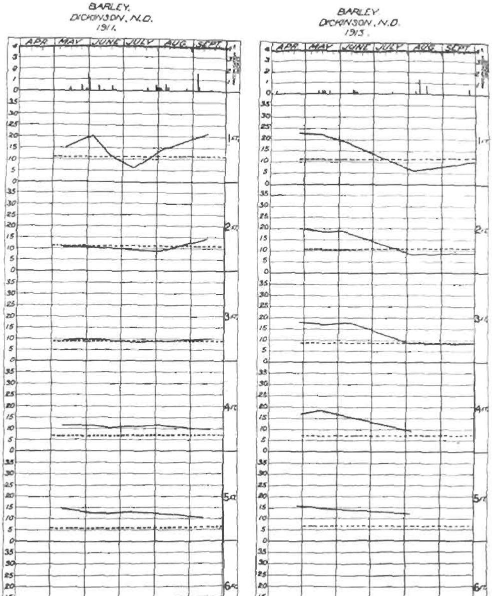


Fig. 6.—Moisture conditions in a barley plat at Dickinson, North Dakota. The *dotted lines represent the wilting co-efficient for each foot section.*

In other words, where the root system is already established, the crop is able to reduce the moisture content below the wilting co-efficient, and can use this to supplement the growth-water that it is drawing from lower levels. (*See* Fig. 5, 1911.) On the other hand, crop plants

* Briggs, L. J., and Shantz, H. L. Application of wilting co-efficient determinations to agronomic investigations.—*Journ. Am. Soc. Agron.* 3, 1911, page 250.

show no tendency to send new roots into soil in which the moisture content is reduced to the wilting co-efficient. (*See* Fig. 6, 1911.)

An example of the application of the wilting co-efficient to the interpretation of moisture determinations is shown in the accompanying measurements by W. M. Osborne,† at Akron, Colorado (Fig. 5). The change in moisture during the season in each foot-section to a depth of 6 feet is shown graphically by the solid lines. The dotted lines represent the wilting co-efficient for each foot-section. The first chart (1911) represents the moisture conditions under a crop of spring wheat during a dry season, the crop being practically a failure. It will be seen that in the spring there was available moisture in small amounts to a depth of 6 feet, the greater part being in the upper 3 feet. The crop had removed the growth-water from the first foot by 1st June; from the second and third feet by 15th June; from the fourth foot by 15th July; while the fifth and sixth feet still contained a limited amount of growth-water at harvest time, although the moisture had been reduced in each case.

The second chart (1912) shows the moisture conditions in the same plat during the next summer while the land was in fallow. At the time the spring samples were taken, the moisture content of the surface foot of soil was practically up to the field-carrying capacity of this soil. With the advent of the seasonal rains, the surface foot began to deliver to the section below. It will be noted that the change in moisture content does not take place simultaneously through the soil mass, but is progressive from foot to foot, each section delivering water to the section below as it rises to its field-carrying capacity. When the moisture supply is below a certain percentage, dependent upon the soil in question, capillary adjustment in that soil is very slow. Plants, in order to avail themselves of all of the growth-water, must consequently develop a root system which permeates the soil mass from which water is being drawn. In other words, when the moisture supply is limited, the capillary distribution becomes so slow as to be effective only through very small distances. Plants having a coarse root system, such as maize, when used as indicator plants, might be expected to give a somewhat higher wilting co-efficient than plants with fine root-systems like the small grains, and this has been observed to be the case.‡

The first chart in Fig. 6 represents the moisture conditions, as measured by J. C. Thysell†, in a barley plat at Dickinson, North Dakota, during the dry season of 1911. This plat is normally seeded to barley each year. Inspection of the chart will show that at the beginning of the season the moisture content of the second and third feet was at the wilting co-efficient, to which it had been reduced by the preceding crop. A good supply of growth-water was present in the fourth, fifth, and sixth feet of the soil, but the roots were unable to penetrate the intervening dry layer, and the crop was a failure. In 1912 the crop was destroyed by hail, so that the plat was virtually in fallow during this season. The rainfall in 1912 was ample, and the soil was well supplied with water in the spring of 1913, as shown in the second part of the

† Office of Dry Land Agriculture in co-operation with the Office of Biophysical Investigations.

‡ Briggs and Shantz. Op. cit.

chart. During this year, a heavy crop of barley was grown, which was produced in part with water present in the soil in 1911, but unavailable to the 1911 crop because the intervening soil was reduced to the wilting co-efficient before the root system was established. It would be difficult to interpret these moisture conditions without the aid of the wilting co-efficient determinations, especially where the moisture retentivity of the soil and subsoil is not the same, as in the case of the Dickinson soils.

The growth-water content at seed time and harvest in two plats at Akron, Colorado, is shown graphically in Fig. 7, for six years. These

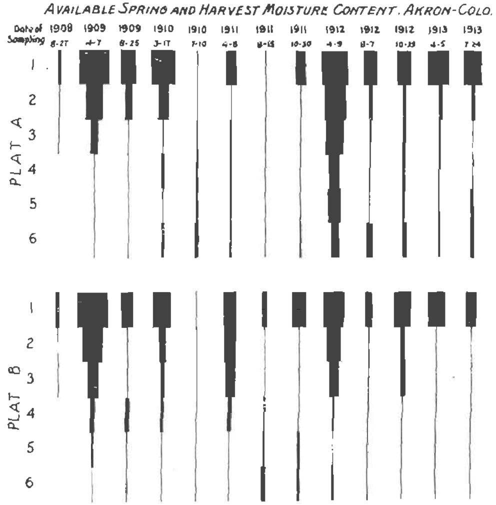


Fig. 7.—Growth-water at seed time and harvest in spring ploughed (A) and fall ploughed (B) plats continuously cropped to grain.

plats form part of the cultural experiments of the Office of Dry Land Agriculture, and are continuously cropped to spring wheat, A being spring-ploughed, and B fall-ploughed. The width of the shaded portion in each foot-section shows the amount of growth-water. It will be noted that the growth-water was in every instance practically exhausted at harvest time, with the exception of the surface foot, which, in some instances, had been moistened by rains near the harvest period. It also appears that at this station the time of ploughing has little influence on the soil moisture content.

Maintenance of the Fertility of the Dry Farm.

The maintenance of fertility under a system of continuous grain farming, such as is practised in many dry-farming sections, bids fair to become a more and more serious problem as the years advance. The period of cultivation of much of the dry-farm land has been so short as to afford no information on this point. In any event, it is hardly a problem that can be taken up with the man who breaks the virgin land. His first concern is for bread, and his chief desire is to draw upon the resources of his land to its fullest capacity. It is only after a marked decrease in production has occurred that he will listen to measures designed to maintain the fertility of the soil. Happily, grain farming, as practised on some of the oldest dry-farms in Utah, does not yet appear to have diminished the productiveness of the soil. This is doubtless due in part at least to the fact that the wheat has been cut with a header (or more recently with a combined harvester) which leaves most of the straw on the land. Stewart and Hirst* have found that the humus and nitrogen content of the surface soil of the wheat lands farmed for ten years or more, has not fallen below that of adjacent virgin soils. In an earlier investigation, Stewart† found that the oldest wheat lands in Utah, under cultivation for fourteen to forty-one years, either continuously or by summer-fallowing methods, had showed no loss in humus or nitrogen in the surface foot. The second foot of the cultivated soils showed, however, a slightly lower nitrogen content than the virgin land. The yield also appears to have been maintained.

A wanton waste of organic matter occurs in many dry-farming sections in the northern Great Plains, and in California. The stubble is burned to make the ploughing easier and to destroy weed seeds, and the straw stacks are burned in the field because they are in the path of the ploughs. As the ploughing season approaches, the horizon is often lighted at night in every direction by the flames of the burning stacks. Even where straw alone has been removed, grain farming in the Great Plains has resulted in a marked decrease in the nitrogen and humus of the soil. Alway‡ has shown that the cultivation of the loose soils of Nebraska has been accompanied by a marked reduction in nitrates, total organic matter, and humus. He attributes the greatest loss of these components to the washing or blowing away of the surface soil.

Snyder§ found that the loss of nitrogen from four Minnesota grain farms in ten years was from four to six times that removed by the crops. This loss he attributes to the rapid breaking up of the humus under cultivation. Where legumes were grown, crop-rotations practised, live-stock kept, and the farm manure used, the nitrogen content of the soil was maintained. This practice the dry-farmer of the Great Plains must eventually adopt, as far as his conditions will permit, if a permanent agriculture is to be assured in these sections. The American dry-farmer has much to learn from Australian practice in the use of stock, especially sheep, on the dry-farm.

* *Journ. Am. Soc. Agron.*, 6, 49, 1914.

† Utah Experiment Station, Bulletin, 109, 1910.

‡ Bulletin 111, Nebraska Experiment Station, 1909.

§ Bulletin 84, Minnesota Experiment Station, 1906.

The Water Requirement of Different Dry-farm Crops.

A word must be said in regard to the importance of considering the water requirement of crops grown on the dry-farm. Other things being equal, those crops which are most efficient in the use of water are obviously best adapted to dry-land conditions. The great success of millet, sorghum, and maize in American dry-farming is due in part at least to their remarkable efficiency in the use of water. The amount of water required for the production of a pound of dry matter of some strains of alfalfa is four times that required by millet, where the two crops are growing side by side. Different varieties of the same crop often exhibit wide differences in water requirement. The following figures represent the range in water requirement due to varietal differences as measured by Briggs and Shantz† in the Great Plains.

TABLE III.—VARIETAL RANGE IN THE WATER REQUIREMENT OF DIFFERENT CROPS.

Crop.	Pounds water required to produce one pound of dry matter of the	
	Most efficient variety.	Least efficient variety.
Millet	261 = 15	444 = 9
Proso	268 = 1	341 = 10
Sorghum	285 = 3	467 = 9
Maize	315 = 3	413 = 5
Wheat	473 = 8	559 = 4
Barley	502 = 4	578 = 13
Oats	559 = 8	622 = 9
Clover	789 = 9	805 = 5
Alfalfa	651 = 12	963 = 9

These wide crop and varietal differences in water requirement suggest great possibilities in the development of strains for dry-land conditions. In fact, the measurement of the water requirement affords a novel and promising method of attack in the breeding and selection of dry-land crops.

† *Journal of Agricultural Research*, United States Department of Agriculture, 3, 58 1914.

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 381.)

INTERCULTIVATION.

In twelve to fifteen days after planting, the maize should be above ground 6 or 7 inches, and at this stage the harrows should be run over the field across the rows; in this way the maximum amount of good will result with the minimum amount of damage. If the maize has grown to a greater height, and the harrows are liable to break the stems, this operation must be dispensed with. Later on, the cultivator should be run between the rows at intervals, or following any rainfall that cakes or crusts the surface, and cultivation should continue until the maize is 6 feet high. Shallow working at a depth of not more than 3 inches at first, and at a still less depth as the crop grows, until the last two cultivations are merely skimmers. The maize roots are very fine and numerous. They must have air, and breaking the surface of the soil admits air easily. Weeds are kept down in this way, and the rainfall readily admitted to the soil in the right places, the broken surface also prevents loss of moisture by evaporation, which can otherwise take place at the rate of 300 to 400 tons of water per acre in three to four dry weeks; such a loss might easily mean the difference between profit or loss on the crop. Nitrification is increased, and further phosphoric acid and potash supplies liberated. Tyne cultivators do more effective work at this stage than discs, letting the fine soil fall to the bottom and bringing the lumps to the top, the surface is thus more open. Hilling is not recommended, as generally more harm than good is done; only when the maize is falling badly should it be practised. Intercultivation is just as important on exactly the same lines for fodder maize as for grain, in order to get the highest food values and quantities.

SUCKERING, TOPPING, DETASSELLING.

Suckering is rarely practised, though some maize varieties are bad in this respect, the effect of suckering on the yield does not, as a rule, compensate for the labour involved, and it is only where the suckers can be used as fodder for dairy cows or some other purpose that it will pay. When suckering, care should be taken not to injure the main plant; cutting with a heavy butcher's knife is the best plan.

Topping, except where fodder is required, is not advisable, the yield being affected. The greatest nutritive value in the green plant is in the upper portion as fodder, and only as fodder is it of value.

De-tasselling has proved a mistake, the yield being depreciated thereby.

SOWING CATCH CROPS.

The habit of sowing clovers, rye, vetches, &c., amongst the maize before harvesting is not generally adopted in Victoria, though in some cases it might be advantageous both from a fodder point of view, and

also as a useful rotation, for reasons previously given under "Rotation Cropping." A good start is often secured in this way for winter feed, the maize protecting the young grasses and crops throughout the autumn.

HARVESTING.

Maize is generally allowed to ripen well on the stalk and remain until May, June, or July, before picking the ears is attempted. Some varieties are, however, ready well before this period, and could, if required, be picked as early as March and April. There are several different methods in vogue, the most popular and probably the best being to pick the ear and husk it at the same time, the cobs being then bagged and taken to the crib or bin, where it is left to dry. The crop must be quite ripe before the husking can be done in the field. The cost of so harvesting is 6d. per 4-bushel bag of cobs.

It is claimed that a satisfactory machine is now in use for gathering and husking ears; it is, however, cumbersome, requiring six horses to pull, and is only effective where the maize stands up well, and the work is done on a large scale.

Where husking is done by hand, a short knife blade in a sheaf strapped across the palm of the hand is of great assistance in removing a refractory husk.

In some cases the ears are harvested with the husk on and carted to a shed, where later on the husk is removed. This is not always a safe practice, as the ears may contain too much moisture, and when thrown down in heaps mould is liable to occur, and damage the quality, colour, and germinating power of the grain.

For silage, the right stage to harvest maize is when the grain is just beginning to harden from the milk stage; at this time the crop has made its maximum growth. There is more sugar in the stalk, and the highest degree of food value has been reached. It is better to cut a little on the ripe side than too green, always bearing in mind that at least 70 per cent. of moisture is necessary for the successful making of silage. The addition of water sprinkled over the silage as it is put into the silo, if on the dry side, will be of advantage. The crop should be carted to the silo or stack as soon as cut, and at least a depth of 5 feet piled in and well tramped each day. The great secret in making silage is the exclusion of air, tight and close packing with pressure being the best means of obtaining this condition. All silage is better for being chaffed, as it lies closer and is more easily handled when required for feeding purposes; there is also less waste. Where stack silage is made of the whole stalk it is imperative that the stalks lie straight, lengthways in the stack, otherwise it will not pack well. A good dose of water on top of the silage when the stack is finished will hermetically seal the surface, after which weights can be put on in the shape of sand bags, rails, logs, or any convenient material.

Silage in the silo should be removed in layers from the top at the rate of from 12 inches to 24 inches per day; at a lesser rate the air will penetrate, and sour or mould the silage in the surface layers, slightly reducing its palatability. In stack silage, the weights can be removed from the end a few feet, and thrown back on the stack, and the silage cut in benches, with a hay knife, sharp steel spade, or axe.

About 40 lbs. of good silage is a daily ration for a cow, but to get full value as a food, it should be mixed with 5 to 10 lbs. of oaten hay or 2 lbs. of bran.

For sheep, 1½ lbs. to 2½ lbs. per day will be found sufficient to keep them alive, young growing sheep requiring more than the matured animals. For sheep especially, the addition of a few oats fed with the silage will make a good balance ration.

STOVER.

An immense waste of fodder takes place every year in the maize stalks, which should be turned to a profitable account by making them into stover, as is the case in the maize-growing districts in America, and in times of drought, such as are experienced in Victoria from time to time, large supplies of valuable fodder could be supplied in this way with *considerable profit to growers.*

There is roughly 20,000 acres of maize grown in Victoria, and taking the average yield of stalks at a low estimate, viz., 6 tons per acre, 120,000 tons of fodder could be obtained from such a source.

The feeding value of stover is nearly equal to that of oaten straw, *as is shown hereunder, vide* Thomas Shaw, on Feeding Farm Animals.

	Total Dry Matter.	Protein.	Carbo-hydrates.	Fat.	Fuel Value.
Oat straw ..	90.8	1.20	38.64	0.76	77.310
Stover ..	59.5	1.98	33.16	0.57	67.766

This is admittedly low, but in times of drought and scarcity of fodder, would be worth from £2 to £4 per ton, and might be the means of saving a large number of stock to the State and the individual. The cost of making stover should not exceed 15s. per ton, and, at the same time, the stalks of the maize being cleaned up, a process which, under present systems in Victoria, is a matter of expense to the grower. Harvesters are used in America to cut the crop when ripe, stalk, cob, and husk together; the whole is then stooked in open stooks to allow free circulation of air to allow the ears to dry without danger of mildew, and later the ears are passed through a machine which husks and threshes the grain.

The stalks are then passed through a shredder, and the material so obtained stored away for use. The object of cutting the whole crop is to save the greatest possible feed value in the stalks, which, if left to dry in the field, would deteriorate more or less.

In feeding maize stover to stock, some better quality food, such as bran, lucerne, oats, &c., should be mixed with the stover, which, by itself, is only equal to straw chaff.

(To be continued.)

THE WALNUT.

(Continued from page 473.)

C. F. Cole, Orchard Supervisor.

PROPAGATION—*continued.*

NURSERY GRAFTING.

The successful propagation of any selected variety of the walnut either by grafting or budding is not so easily accomplished as ordinary fruits, such as the apple or pear.

The operation of grafting or budding requires to be carefully performed by a skilled and practised hand. Even when performed by the most skilled and under the most favorable conditions, the average percentage of successes would be considered unsatisfactory compared with the results from the same class of work upon the commoner fruits of commerce.

The propagation of this nut is carried out by grafting or budding at the proper seasons of the year, although grafting is the most favoured, budding may be practised in conjunction with it. Grafting has a decided advantage over budding, as, with the walnut, it is easier and more quickly performed, and usually greater success results. There are many methods of grafting; whichever is adopted needs skill and practice.

The following method described and recommended for nursery work by the writer is one that has proved to be most successful, both with the walnut and other species of fruits difficult to propagate. It is practically a combination of the cleft and whip grafting methods. The advantage is that three surfaces upon the cut scion come in contact with equal parts of the cambium, or inner bark, upon the stub of the seedling root stock. (Plates 34B, 35C.)

The time to commence grafting operations is in early spring before the seedling trees commence growth, finishing by the time they are coming into leaf.

Grafting wood for scion purposes of any desired variety should be chosen from trees of productive, healthy, and vigorous habit. Well-matured wood of the previous season's growth with little pith and full buds spaced not too far apart should be selected. Two-year-old wood may be used if it has good buds, and should be cut from the tree during the winter and after growth has become dormant. Scions cut from trees whilst the sap is active should not be used. The grafting wood from the tree, if it is to retain its moisture and vitality, must be either buried in moist sand, sawdust, sphagnum moss, or heeled in in a cool sheltered place, shed or cellar. Care must be exercised in seeing that the material is moist and kept so; excessively wet or dry conditions are injurious to the walnut scion. When grafting, unhealthy scions and dark wood should be discarded. Upon the removal of the grafting wood from the sand, rinse carefully in clean soft cold water to remove any grit that might tend to dull the keen edge of the grafting knife, which should be kept always sharp and clean.

When cutting the scions into lengths just before grafting there should be not less than two buds upon each scion, one at each end, the lower bud should be about 1½ inches up from the lower end of the scion. Plate 34B X indicates position of lower bud. Before commencing, the operator should provide himself with a small box or other suitable receptacle for holding the scions of different sizes, a whetstone and leather strop, a pair of secateurs, pruning saw, brush, raffia or some soft twine for binding purposes, a heating stove for keeping the grafting wax melted. This stove can be made from a small oil drum,

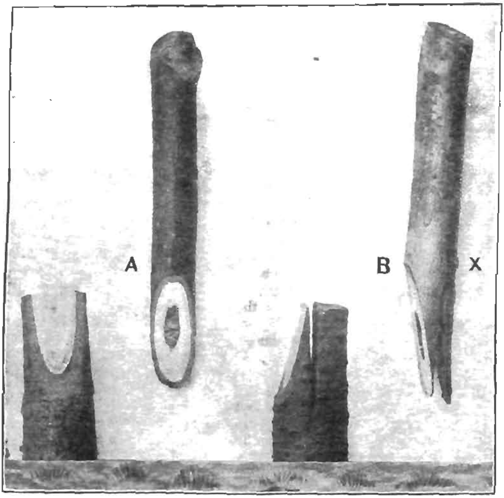


Plate 34.—Grafting Method.

A. Front view of cut stub and scion.
B. Side view. X indicates position of lower bud.

cutting out a piece near the bottom, and making a few holes around the lower portion similar to one used by a plumber for heating his soldering irons.

Grafting wax is prepared as follows—3 lbs. of pulverized resin, 1 lb. of beeswax, ½ lb. of lard, tallow, or fat containing no salt, ½ pint linseed oil, boiled or raw, may be substituted for lard, fat, &c.

Another formula is to use equal quantities of resin and paraffin wax. When making grafting wax place the oil, wax, and other ingredients

in first, and then add the resin, stirring whilst melting. The consistency of the wax can be regulated by adding more resin if not hard enough, and more fatty substances if softening is required. A harder wax is necessary in hot than in mild or cold weather.

The first work necessary when starting nursery grafting is to carefully remove the soil from about the seedlings to be operated upon, exposing the butt down to the crown of the root. If the soil has been kept well stirred this can be easily accomplished. If the soil is hard around the seedlings it may be necessary to apply water some hours before attempting to remove the soil. The seedling tree should be cut off with a sharp pair of secateurs or saw, close to the ground, leaving sufficient of the butt to operate upon. Before using the knife upon the stub it is advisable to rub off any particles of dirt. The operator should then pare away and level off the top of the stub, and upon one side make a clean upward sloping cut,, not cutting so far in as to remove too much wood. Now, with the blade of the knife, split the stub down on this side for about 1 inch (plate 34B), splitting the stub down through the pith should be avoided if possible. Some grafters make the split first, and the upward sloping cut last, whichever way this part of the work is performed the operator should take care to see that the surface of the sloping cut is level, and not left too thick at the upper end (plate 34B), otherwise the scion, when inserted, may not fit close and neatly. The scion, when placed in position, should fit tight, the cambium or inner bark coming in contact with the three different surfaces (plate 35C).

Having prepared the stub, a scion should be selected not larger, but may be smaller, than the stub. A clean smooth sloping cut should be made at the bottom end of the scion and directly opposite to the bud. The blade of the knife is then inserted between the bark and the pith at the lower end on the longest side of the scion, a cut being made upwards nearly to the bud. This upward slit or cut, when properly made, should have only a thin strip of the wood with the bark (plate 34B). Then the cut scion is inserted upon the prepared stub, as shown in plate 35C. The stock and scion should be firmly bound with raffia or soft twine to hold them firmly together. The union should then be thoroughly waxed over, and also the cut upon the upper end of the scion (plate 35DE). It is essential that no part of the cut stock and scion is left unwaxed. Having performed this work, the last operation is to replace the soil, covering the scion and stub well. This covering with soil must be carefully performed, so as not to displace or break out the scion. The soil should be worked up fine and friable before the moulding operations take place. If grafting a large number of trees, the operator should have an assistant to remove the soil, cut off the seedlings, and do the waxing and tying, which must be done without delay after cutting to avoid drying out. If the grafting has been successful it will not be long before the scions start to shoot. Robber sprouts from the stub of the seedling stock, will also appear, and these must be carefully removed as soon as the growth from the scion is well started. At this period attention must be paid to the binding, the raffia or twine should be cut through so as to allow the gradual expansion of the scion and stock, thus preventing cutting in and causing injury. This should be accomplished by removing with

the point of a knife a narrow strip of the wax at the back of the stub, exposing the binding for cutting. Under no conditions should the binding and wax be removed. After cutting the binding replace the soil so as to cover again the union of stock and scion. As soon as the shoots start to grow rapidly it is necessary to stake and tie them, using stout stakes about 6 feet high the tying being done carefully and *not too tightly*, using soft twine or rope. As the walnut makes rapid growth, attention must be paid to the tying to see that it is not cutting

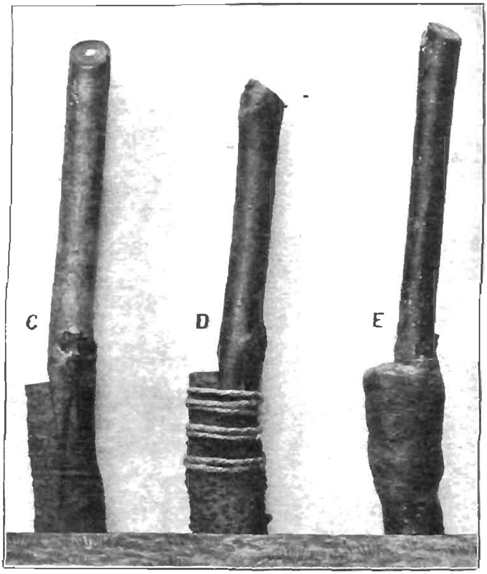


Plate 35.—Grafting Method.
C. Inserted scion. D. Tied. E. Waxed.

in and causing injury to the developing shoot. If the scion sends up more than one shoot, the stronger should be tied to the stake and the other carefully removed. If the lower bud upon the scion makes the stronger shoot, do not attempt to cut the scion off close to the lower shoot to be left, remove the top shoot only by cutting away close to the top of the scion. The useless piece of the scion can be cut away at any future time.

If the graft does not take, one of the strong shoots sprouting from the stub of the seedling should be allowed to grow, and may be budded or left for grafting upon the following spring.

If the union between the scion and stock is poorly callused and the growth of the scion is weakly, the young grafted tree should be discarded, nothing but strong healthy stocks should be grafted, and only grafted trees that are strong and vigorous in the nursery row planted out. With care, and grown under favorable conditions, the majority of the grafts should be large enough to transplant the following winter in orchard form.

TOP GRAFTING.

Seedling trees that have been planted out in orchard form with the object of top working them over with selected varieties may either be grafted upon the main stem, if not more than 3 to 4 inches in diameter, cut off 2 to 5 feet from the ground level, or else upon the branches, reducing them back close to the main forks of the tree. It is not advisable to cut off and graft upon any very large limbs. Not alone is the scion less certain to take than when inserted upon a smaller one, but by exposing a large surface the wood is very susceptible to decay. The time for cutting off the top or limbs for head grafting is just before the trees start to send out new growth in the spring. Ground grafting is performed at the same time. When sawing off the top or boughs, care must be taken not to split, or tear the bark down the stub.

In America the usual method of top grafting the walnut is the ordinary cleft graft commonly practised in Victoria upon many kinds of fruits. When performing the work it is usual to split the stub through the middle, insert the wedge in the cleft trim the split edges of the bark and cambium with a sharp knife, cut the scion to a smooth bevel upon either side, and insert the scion carefully, seeing that a good fit is made and the cambium layer of the stub and scion brought into direct contact. A somewhat different method of cleft grafting practised at times upon large fruit trees here is favoured by some in America when the stubs are more than 2 inches in diameter. Instead of making one cleft across the middle of the stub, two or more are made at uniform distances apart near the edge. In making the splits, the splitting knife is held in a horizontal position over the place where the cleft is desired, and driven to a depth of about half-an-inch. It is then tilted up in a slanting position and driven down to a depth of $1\frac{1}{2}$ to 2 inches, first at one end of the cut and then the other—the rough edges of the bark are smoothed with a sharp knife, and the cleft held open to receive the scions. The scions are prepared by bevelling off one end into a wedge shape, cutting clean through the pith on one side, and then down to the pith upon the other. The back side of the wedge, that which is placed towards the outside of the stub, is made wider than the side which goes towards the interior of the stub.

There should be not less than two buds upon the scions, one at each end, as already depicted in plates 34 and 35.

In cleft grafting it is advisable to slant the point of the scion a little towards the center of the stub, so that the upper end of the scion

points outwards somewhat, thus making certain that the cambium will meet at one point. By adopting this latter method of cleft grafting more scions can be inserted which, when grafting the walnut, is an important factor, because the more that take upon a stub the quicker will the cut surface heal over, even if it is necessary to cut off some of the growths the following year. After inserting the scions, bind with soft twine several times around the stub. As soon as this part of the work is finished, paint with grafting wax the whole of the surface of the stub and the clefts holding the scions. This part of the work is most important, and no places should be left unwaxed, however small, to allow the air or moisture to penetrate, for if this occurs the scion is certain to fail. It is also necessary to go over the stub regularly and renew the painting with grafting wax until the scions are thoroughly united. The whole of the scion must not be waxed, only that portion near and inserted in the cleft, and the cut top of the scion. The heading back of the trees for top grafting will result in numerous shoots sprouting out upon the stubs; these must be removed, and not allowed to smother the scions. If no scions have taken upon any one stub a shoot or two should be left upon each stub, allowing the tree to make foliage and carry on its normal functions. As soon as the scions begin to sprout it will be necessary to support them to prevent them becoming top heavy and broken out by the wind. Where the scions are inserted upon the trunks, tying to a stout stake will meet the case. The method adopted in America when branch grafting is practised is to nail 6-feet laths to the stubs into which the scions were inserted, and tie the sprouts loosely and firmly to these laths, removing the laths the following year if not required any longer. As a preventive against the trunk and branches getting sunburnt after grafting the Americans paint with a thick, heavy whitewash.

At the end of the first season's growth the trees should be gone over and all superfluous shoots cut out, the dead ends of the stubs cut off and carefully waxed over, and any shoots that are left removed, if not required for future grafting purposes.

The binding around the end of the stub should receive attention so that injury will not be done to the expanding wood of the scion and stub.

BUDDING.

The operation of budding the walnut is more difficult than that of ordinary fruit trees; yet considerable success has been attained, but results are somewhat uncertain even at the best. The usual method method is called the annular budding. (Plate 36EF.)

The results of experiments carried out in America the most favoured form of budding is a partial ring or flute bud extending only part of the way round the stem instead of the whole way, as in the annular method. In America, this flute budding is performed in the nursery row, upon new sprouts from one year old seedling stocks upon which the grafts had failed, or seedlings which had been too small to graft during the winter; also upon shoots from the stubs of top-grafted trees where the grafts had failed. The work is performed at two seasons of the year, spring and the autumn. For spring budding the buds are taken from dormant wood cut during the previous winter at the same

time as the scions for grafting. If properly stored in a cool place with neither too much nor too little moisture, the scions will begin to callus at the ends, and the buds can be readily removed. In Victoria, from October to December would be the proper time to carry out the work. For autumn budding the buds are selected from the oldest wood of the current season's growth, cutting off the leaf stalks just beyond the buds about two weeks previous to budding. The leaf stalks drop off cleanly in a few days, leaving the buds ready for use. If the leaves

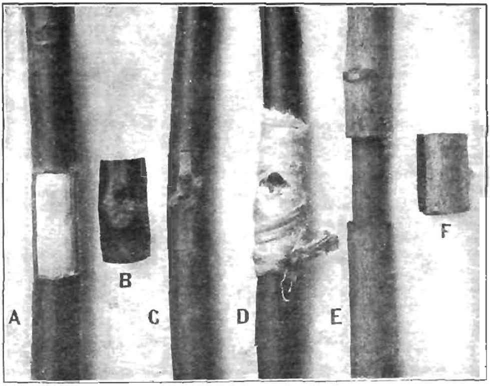


Plate 36.—Budding Methods.

A. B. C. D. *Flute method.* E. F. *Annular method.*

A. Shoot ready to receive the bud.
B. Cut bud ready for placing in position.
C. Bud placed in position on the shoot.
D. Bud tied with waxed strip of calico.
E. Annular method, shoot cut ready for bud.
F. Cut bud ready for placing in position.

are cut too soon the buds are apt to start into growth whilst on the parent tree. The time for autumn budding in Victoria is the month of March. The most favoured size of bud having a portion of bark attached is about ½ inch to ¾ inch wide, and ¾ inch long. The former dimensions is that measured around the stem and the latter the vertical distance. When budding, the operator must use judgment in selecting seedling stocks or sprouts of such a size that the strip of bark bearing the bud will be of the right size, and not extend more than half way round the stock or sprout to be operated upon (plate 36 ABC). For annular (ring) or flute budding, a double-bladed knife is the most suitable. By fixing two knife blades of equal size upon a wooden handle ¾ inch

apart the operator will have a very useful knife for cutting and placing the buds in position. The buds may be put in just above ground level, 6 inches high, or where the stock has the proper size, so long as space is left for further attempts if the first bud is not successful.

When stripping off the bud after cutting, the core of wood inside the bud should remain in place without any difficulty; with good buds it is simply necessary to strip off the bark without attempting to include any of the wood. The most important factor in walnut budding seems to be rapidity in cutting and placing the bud in position, and binding, because of the tendency of the freshly-exposed walnut tissue to oxidize and turn black. If this once happens the tissue is sure to die, and no union between the stock will take place.

In budding walnuts particular skill and dexterity is necessary, in order that the fresh surfaces or cambium of the bud and stock may be exposed as little as possible to the air during the operation. A close fit is essential, and the inner surface of the bark should come into close contact with the whole exposed surface of the cut in the stock.

This is where the value of a double-bladed knife comes in, as no time is lost measuring the cut bud on the stock to get it the same size. The bark upon the stock should be removed first. If there is any delay after cutting the bud an American authority advises putting it in the mouth until ready to place upon the stock, and that there should not be the slightest delay at any stage of the operation. As soon as the bud is placed in position it should be tied with waxed calico cut into suitable length and width (plate 36D). With spring or summer budding this binding should be removed about fourteen to 21 days later, with autumn budding six or seven weeks later. Autumn buds remain dormant over the winter. The spring or summer buds should be forced into growth by reducing back the seedling stock or sprout about one-half after the binding is removed. After the bud has started into growth the stock should be cut back close to the bud, and the cut waxed over. With autumn buds the stocks should be cut off close to the buds when they start to sprout. Staking and care of the buds is the same as with grafts, and already described under heading of "Grafting."

(To be continued.)

A SUBSCRIBER to the *New Zealand Journal of Agriculture* writes—"A man is a fool to cart out green stuff to his cows when he can have silage. I used to feed green crops, cutting the material every day and carting it to the cows. Now I put all my green stuff into a silo—which takes only a few days—and I have a continuous supply of good feed without having to go out every day in all weathers to cut it. The silage saves the daily labour, while the land is unlocked and can be used for grazing or for growing some other crop.

WOOL CLASSING.

The following are extracts from a paper on "Wool Classing" read by Mr. Digby B. Grist, before the National Sheep-breeders' Association, at the Nottingham Conference, 1915:—

The title of this paper may be misleading to the ordinary farmer, as many farmers do not discriminate between "classing" and "sorting," and often the word "sorting" is used where only classing is meant. So let me say right away that classing is the first process to be applied to the fleece and is a work that any farmer, shepherd, or man of ordinary intelligence can do. Sorting, however, is a trade that no one can attempt unless he has served his time to a wool stapler, wool merchant, or manufacturer who buys his own wool and sorts it for the different kinds of cloth he makes. To further define these two processes, I would say *classing fleeces* merely means keeping the coarse from the fine, the long from the short, the dirty from the clean, and the heavy from the light. These four simple classings speak for themselves. Anybody with ordinary observation can decide whether a fleece is fine or coarse, short or long, light in condition or heavy. The condition of a fleece is determined by the amount of natural grease yolk and earthy matter it contains. If deficient in these respects it will be dry and light. If these four simple points were borne in mind by the farmer when shearing he would see at a glance, by throwing the fleece on a table or bench, which class it belonged to, and at the same time he would also be able to break off any hairy or dirty trimmings which may be adhering to the fleece. It is of the utmost importance to keep the *hairy leg portions* out of the fleece. These only amount to a few ounces, and do incalculable damage to the whole fleece, where they are treated as some farmers treat them, namely, rolled in a ball and included in the fleece. When shearing they are no trouble to take off and keep separate.

With regard to these trimmings, though it may not be generally known, the very fact of these few ounces of kempy wool being included in the fleece brings down the value of the whole, whereas if kept out a greater price is given for the bulk, and the trimmings, if sold separately, command a good market, as there are merchants who only deal in this inferior wool.

The processes I have enumerated constitute classing, and any farmer who takes the trouble to grasp the simplicity of it will readily see that it takes no longer to do up wool in this way than in the way he has been accustomed to, especially as there is no need to continue the old-fashioned way of *winding* the fleece or of tying it with string. All that is required is that the fleeces should be neatly rolled up, with one end tucked in to keep it intact.

Wool sorting is another process altogether. It is the breaking up of the fleece into many sorts to suit the manufacturer, which subject need not be touched upon here.

The advantages of classing wool were early recognised by Australian pioneers, and in the very early days of this Colony it was discovered that those who paid the most attention to this very necessary process obtained better average prices for their wool. The get-up of wool in

Australia has passed through several evolutions, the original wool-growers following the custom of English farmers in cold water washing the sheep. All wool that came from the Antipodes in the early days was treated in this way, and in the London catalogues the plain word "combing" was used to designate this class, all others having a prefix such as "greasy combing," "scoured combing," &c.

The extension of the sheep-growing industry from the coast and well-watered districts to the dry plains and pastures of the interior created difficulties, and at many stations it was found that sufficient water did not exist to wash the sheep thoroughly, so an experiment was tried in sending the wool to Europe in the grease. Manufacturers soon adapted themselves to the altered conditions, and eventually preferred the greasy wool to the washed, as it enabled them to treat the fleeces from the commencement and obtain better results by the greater or lesser quantity of grease left in the staple. The change was also agreeable to the grower, as it saved working the sheep at the cold water runs, and sheep can never be worked in large quantities without loss, and at the same time saved labour—a most important matter in a new Colony where men are scarce.

It was natural when all parties were in agreement that the days of washing wool were numbered, and at the present time out of the million and a half or two million bales that came from Australia only a few hundred bales of an exceptional fine breed of Merino, come to London in a washed state. It is true this merino wool realizes extraordinary prices—up to 4s. or 5s. per lb.—but the sheep are small, as a rule, due to the climate being cold, and they do not pay like the larger framed and heavier fleeced animals of warmer districts. A good deal of wool is scoured on stations long distances away from railroads to save expense in carting, but when practical it is always sent in its natural condition.

The system of classing has been carried to great lengths on the larger holdings in Australia, where from 100,000 to 200,000 sheep are shorn, classers know their work, and it must be clearly understood that in large flocks wool cannot be overclassed, as both here and on the continent manufacturers specialize in certain qualities, and the nearer they can buy wool to the quality they want the more they will give for it. It may be better explained by stating that some buyers only use Lincoln and Leicester wools, while others confine their operations entirely to cross-bred sorts, others to merinoes. Wether and ewe wool have also their separate admirers, so it can be easily understood that when all kinds are sold to a dealer in bulk unclassed he gives an average price and by classing the fleeces obtains the profit that might go to the grower, who could easily do this for himself.

The question of skirting is also a most important one, and the system that prevails to a large extent among lamb-raising flocks of rolling all skirts and ends in the fleeces is antiquated and pernicious, as it means the buyer has to estimate the quantity of inferior wool which he cannot see, and this estimate is seldom on the wrong side, and must tell very much against the interest of the seller in the long run.

The colonial markets are visited by buyers from all parts of the world, some to buy greasy wool, some to buy scoured, some to buy fine wools, and some to buy coarse, and some who confine their purchases exclusively to pieces and locks, and surely this is the best place to offer

your produce, and it is worth while to offer it in a condition to meet the demands of the market. It is a market where the man who takes the greatest care in the breeding of his sheep and the get-up of his wool gets the highest prices, and where competition instils into growers the spirit of emulation which is so necessary in obtaining the best results.

Buyers from all over the world congregate at the great wool sales held in leading cities. Wool is sold from New South Wales, Tasmania, Queensland, Victoria, West and South Australia, and New Zealand. The largest buyers from all parts of the world compete for its purchase, because they have the best opportunities of getting the kind of wool they want, and in the quantities in which they want it, and without having at the same time to buy what they do not want.

VINEGAR FROM WATER MELONS.

A New Mexico man has discovered a new use for the water melon. Reports from that State indicate that J. B. Page, of Deming, has built a mill at Myndus, in the Mimbres Valley of New Mexico, by which he will grind water melons into pulp and convert the juice into vinegar.

The first lot of melons were turned into the grind in September. The mill is supplied from 300 acres of melons. It is 118 by 80 feet, with a boiler-house 30 by 20 feet adjoining. The two boilers are 125 h.p. each, and the engine 125 h.p. The mill employs 20 men, and will manufacture 300,000 gals. of vinegar this season. The mill will also manufacture by-products, as table oils, pickles, preserves, syrups, and stock foods.—[Extract from *Pure Products*, May, 1915.]

RESULTS OF TESTS OF IMPORTED VARIETIES OF PEAS AND BARLEYS.

Last season, the Department of Agriculture secured, from the United States Bureau of Plant Industry, in exchange for certain varieties of wheat, a number of varieties of Pease and Barleys.

These were sown at the Central Research Farm, Werribee, in 1914, and, though the seasonal conditions were most unfavorable, the results obtained from some of the varieties were very satisfactory.

Only small quantities of seed of each were available, consequently the seed had necessarily to be sown in small plots. In order to make the trials as even as possible, the varieties were sown in single rows, 5 chains long, and certain standard Victorian varieties were sown alongside for purposes of comparison. The plots received one watering in August.

The attached tables, prepared by Field Officer G. S. Gordon, Central Research Farm, Werribee, give the results of the tests with Barley and Pease.

Table I.

Showing Summary of Tests of Local and Imported Varieties of Barleys at Central Research Farm, Werribee.

Season 1914.

	Variety.	Seed from	Sown.	Up.	Germination period.	In Ear.	Ripe.	Bulk Yield.	Grain Yield.	Ratio of Grain to Straw	Estimated Yield per acre.
			1914.	1914.	days.	1914.	1914.	lbs.	lbs.		Bush.lbs.
One row to each plot.	Manchurian	U.S.A.	June 10	June 21	11	Oct. 1	Nov. 10	33	14	1 : 1·3	60·38
	Odessa ..	..	.. 10	,, 22	12	.. 7	,, 20	23	8	1 : 1·8	34·36
	Californian Feed	..	.. 10	,, 23	13	.. 7	,, 20	28½	14¼	1 : 1·0	61·42
	Gatami ..	..	.. 10	.. 23	13	,, 10	.. 20	26	8	1 : 2·25	34·36
	Primus ..	..	.. 10	,, 23	13	,, 12	,, 20	30	11	1 : 1·7	47·37
	Hanchen ..	,,	.. 10	,, 21	11	.. 7	,, 19	24	12	1 : 1·0	52·4
	Princess ..	..	.. 10	,, 22	12	.. 10	,, 20	23	10	1 : 1·3	43·20
Six rows to each plot.	Golden Grain	Vict.	June 10	June 23	13	Oct. 13	Nov. 21	122	34	1 : 2·5	24·24
	Gisborne ..	,,	.. 10	,, 23	13	.. 19	.. 20	133½	52½	1 · 1·5	37·40
	Kinver ..	,,	.. 11	.. 24	13	.. 20	,, 21	122½	46	1 : 1·6	33·6
	Goldthorpe	..	.. 11	,, 24	13	.. 18	,, 21	130	51	1 : 1·5	36·36
	Archer ..	,,	,, 11	,, 24	13	.. 19	,, 20	118	41	1 : 1·8	29·26
	Pryor ..	,,	.. 11	.. 24	13	,, 6	.. 20	108½	45½	1 : 1·3	32·38
	Roseworthy Oregon	..	.. 11	.. 24	13	.. 6	.. 20	141	63	1 : 1·2	45·18
	Square Head	,,	.. 11	.. 24	13	,, 7	,, 21	144½	60	1 · 1·4	43·10
	Short Head	..	.. 11	.. 25	14	.. 6	.. 21	155½	61½	1 : 1·5	44·14
	Skinless ..	..	.. 11	,, 24	13	.. 4	.. 21	97	35	1 : 1·7	25·10
	Cape ..	..	.. 13	,, 26	13	,, 6	,, 21	135½	63½	1 : 1·1	45·36

Table II.

Results.—Tests of Local and Imported Peas.

Season 1914.

Plot.	Variety.	Origin of Seed.	Date of Sowing.	Date of Germination.	Date of Flowering.	Date of Podding.	Date of Ripening.	Colour of Flowers	Estimated Yield per acre.
			1914.	1914.	1914.	1914.	1914.		bush. lbs.
1	Dun	Vict.	June 10	June 23	Sept. 30	Oct. 12	Nov. 16	Purple Red	10 9½
2	Partridge ..	,,	,, 10	,, 24	Oct. 12	,, 22	, 23	Purple Red	6 0
3	Tasmanian Blue	,,	,, 10	,, 24	Sept. 24	,, 9	,, 23	White	11 22
4	Black-eyed Susan	,,	,, 10	,, 23	,, 30	,, 14	,, 23	,,	9 47
5	White ..	,,	,, 10	,, 23	..	..	..	..	No seed.
6	Golden Vine ..	U.S.A.	,, 9	,, 24	Sept. 22	Oct. 12	Nov. 3	White	8 40
7	Amaroti ..	,,	,, 9	,, 23	,, 21	,, 13	,, 3	,,	7 45
8	Early Britain ..	,,	,, 9	,, 24	,, 17	,, 7	,, 4	Red ..	8 19
9	Scotch Beauty..	,,	,, 9	,, 24	Nov. 6	..	..	..	No seed.
10	Scotch Blue ..	,,	,, 9	,, 23	,, 6	..	..	..	..
11	Admiral ..	,,	,, 9	,, 24	Sept. 18	Oct. 6	Nov. 1	Lilac ..	10 5
12	Bangalia ..	,,	,, 9	,, 24	,, 17	,, 4	Oct. 28	Purple White	7 26
13	Carleton ..	,,	,, 9	,, 24	Oct. 14	,, 30	Nov. 23	Purple Red	4 49
14	Kaiser ..	,,	,, 9	,, 23	Nov. 6	..	..	..	No seed.
15	French Grey ..	,,	,, 9	,, 24	Oct. 12	Oct. 28	Nov. 23	Purple	5 16
16	Canada Field ..	,,	,, 25	..	..	..	..	White	3 20

THE GREY MOULD OR BOTRYTIS DISEASE OF CITRUS TREES.

By C. C. Brittlebank, Government Vegetable Pathologist.

History of the Disease.

The first record of this disease tabulated in this office was received from the editor of the *Garden and Field*, South Australia, as long ago as September, 1900. Further specimens were not received until September, 1911, and again in September, 1912-13, when many came to hand and the disease appeared to be making headway among our citrus trees, when it was apparently checked by the protracted drought through which the State has just passed.

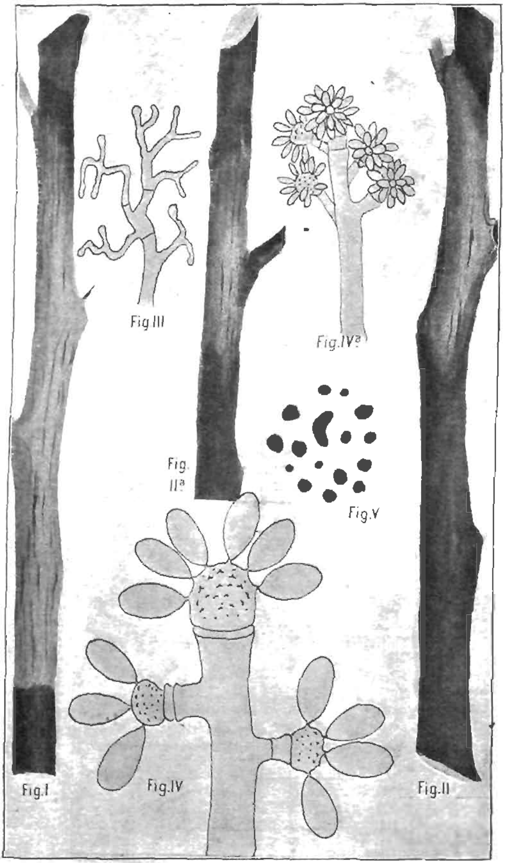
Distribution of the Disease.

Citrus trees have come to hand affected with Botrytis from such widely separated localities as Mildura, Cohuna, Bendigo, Yarrawonga, and also from several places in the north-eastern and south-western portions of the State. Judging from the above wide area it may be safely said that the disease occurs wherever citrus trees are grown.

General Features of Affected Trees.

During 1912 two young lemon trees were forwarded for examination, the grower stating that they were two of many affected in a similar manner. These trees had a stem diameter of 1½ inches and 1¾ inches respectively; they were well grown with fine strong roots, nicely formed heads, and to all appearances had been well cultivated. At a point about 9 inches above the bud, there was in each tree, a diseased-area extending up and completely surrounding the stem for a distance of slightly over 6 inches. The diseased areas were slightly depressed, of a yellowish buff colour, the sunken surface being slightly glazed—the junction of the disease with a seemingly healthy bark both above and below being very sharply defined (Fig. 1 shows small branch of tree). Although examined with great care not the least trace of fungus could be observed on the discoloured portion. From the point of infection upwards the trees under notice had been killed outright.

When large trees are attacked the spread of the fungus in the bark is apparently not so rapid; it lies more or less dormant during the hot, dry summer months, but starts again into activity in early spring and autumn. In extended attacks such as this, gumming is a common feature, and at first sight might easily be taken for the damage caused by the "Collar Rot" fungus. On one large lemon tree I observed no less than thirty-seven distinct areas of infection. On the main stem and branches there were many diseased spots which exuded gum freely, while many of the smaller branches had been completely girdled and killed beyond the portion affected (Figs. II., II.a). This tree is interesting as an example of the destruction which may follow upon neglect. When trees have arrived at this stage of disease their death is only a matter of course, unless control measures are adopted at once.



The Grey Mould or Botrytis Disease of Citrus Trees.

MICROSCOPICAL FEATURES.

Sections were cut which included portions of the diseased and apparently healthy bark. These when stained by the hœmatoxylin and alcoholic eosin method revealed the fact that a dense mycelium was present, not only in the discoloured portion, but for some distance in the still green bark (Fig. III.). The mycelium penetrating at first kills the cells, which is followed by their breaking up and absorption by the fungus. Strips of bark when removed with every care and placed under suitable conditions develop in some cases a dense white mould without evidence of spore formation, but in others a greyish-brown mould at the junction of the diseased and healthy bark. This last development was recognised as Botrytis, and the measurements of conidia approached closely to those of *Botrytis cinerea* Pers., viz., 12 — 13 x 8 — 9 microns (Figs. IV., IVA, highly magnified). Subsequently many specimens were obtained in the field from citrus trees with the Botrytis developed along the margin of the diseased parts. Conidia from these specimens had the same measurements as those obtained from the prepared strips of bark.

LIFE HISTORY OF THE FUNGUS.

The following is a brief account of the life-history: The grey mould or Botrytis fungus is both a saprophyte and parasite, that is, it can live upon dead vegetable matter, and under favorable conditions become a destructive parasite. This greyish mould produces vast numbers of conidia. These are the chief means by which the disease is spread. There is, however, another method by which the fungus can be reproduced, and that is by dense, compact, more or less spherical, masses of felted mycelium known as sclerotia (Fig. V.). These hard black bodies are, in fact, a resting stage, by which the fungus bridges over unfavorable weather conditions. In due time the sclerotia produce spores which, upon germination and fructification, produce the well-known grey mould, thus completing the cycle.

GENERAL REMARKS.

In the field it was found that when diseased citrus twigs or portions of the stems were placed on the soil surface, conidia and sclerotia developed, especially when the weather was wet or foggy. This point is well worth the growers' attention, as the disease, which has so many and varied means of reproduction, will be difficult to eradicate unless prompt measures are undertaken for its suppression on the first appearance in the citrus trees.

CONTROL.

All small infected branches should be cut out, and the infected parts of the larger branches and main stem should have all diseased material cut and scraped away. All prunings, chips, and scrapings obtained in the above operations should be carefully collected and burnt, all wounds made by pruning, &c., should be painted with a mixture of half carbolic acid and half water. Professor H. S. Fawcett, Plant Pathologist, State Commission of Horticulture, Whittier, U.S.A., has successfully held in control a disease which appears to be identical with our Botrytis on citrus trees by the application of a paste made as follows:—1 lb. of bluestone dissolved in a gallon of water, 2 lbs. of unslaked lime, slaked

in about half-a-gallon of water; when cool, mix. This paste is applied to the diseased places after they have been properly prepared by the removal of infected bark, &c. The above paste has also proved effectual against collar rot of lemon trees.

SUMMARY.

From the position of the diseased area in the young lemon trees mentioned above, viz., about 1 foot to 1ft. 3in. above the soil surface, it is probable that the infection took place through wounds caused during cultural operations. From numerous observations there is, I think, little doubt that Botrytis is a wound parasite, and, therefore, all wounds in citrus trees should be treated with one of the above-named mixtures at the earliest possible moment after infliction. This is more necessary if the weather is wet, the moisture content of the air being a factor in the development of this disease, that is to say, a wound to which conidia have gained entrance during dry weather is not so likely to set up infection as wounds in which conidia find lodgment just prior to, or during, rainy weather.

Quite recently a number of seedlings of Eucalyptus citriodora and Jacaranda mimosæfolia, some of which had been badly injured, and others killed, by a fungus disease, were forwarded for examination. The cause of injury and death to these seedlings was found to be due to the same fungus as that injuring the citrus trees mentioned herein.

THE CULTIVATION OF MEDICINAL PLANTS.

Contributed by the Medicinal Plants Board Sub-Committee.

The question of the production of medicinal plants and herbs is becoming a live one in Australia at the present time. The continent of Europe has been the main producer of drug and medicinal plants required here, and, owing to their abundant production, we have allowed ourselves to be dependent upon Europe for our necessary supplies. Owing to the war, these supplies have been very much reduced; it is therefore, well for Australia to concentrate all endeavours so as to be independent of external sources, and to produce as many and as much of the required medicinal drugs as the soil and climate will permit.

In order that full information on the important question of suitable plants and satisfactory conditions for their production may be given, a Medicinal Plants Board is now considering these and other vital phases of the cultivation of such plants. And until such time as the Board has determined several main and important questions, it will be advisable for those who are considering the growing of these plants to exercise due caution, and either make inquiries from the various wholesale chemists as to their requirements, or to wait until the report of the Expert Sub-Committee is published.

It is intended by the Board that experiments shall be carried out with between thirty and forty plants, which will be grown in the various soils and climates that are deemed suitable to their growth. The plants will then be tested and analyzed, and when satisfactory conditions are obtained, reports and recommendations will be issued. The Department of Agriculture, the Education Department and its High Schools, the Melbourne University, and the Melbourne Hospital are co-operating in this work.

For the present, a number of plants are receiving attention, and they are those whose medicinal properties are considerably in demand. The list of these plants is here given:—

1. Aconite	*Aconitum Napellus.* Linn.
2. Beech	*Fagus sylvatica.* Linn.
3. Belladonna	*Atropa Belladonna.* Linn.
4. Bitter or Seville Orange	*Citrus aurantium* var. *Bigaradia.* Hook F.
5. Buchu, or Bucku	*Barosma betulina.* Bart and Wend.
6. Cascara Sagrada	*Rhamnus Purshianus.* D.C.
7. Meadow Saffron	*Colchicum autumnale.* Linn.
8. Foxglove	*Digitalis purpurea.* Linn.
9. Gentian	*Gentiana lutea.* Linn.
10. Golden Seal	*Hydrastis Canadensis.* Linn.
11. Henbane	*Hyoscyamus niger.* Linn.
12. Juniper	*Juniperus communis.* Linn.
13. Licorice	*Glycyrrhiza glabra.* Linn.
14. Lobelia	*Lobelia inflata.* Linn.
15. Male fern	*Dryopteris* (*Aspidium*) *Felix-mas.* Schort.
16. Opium poppy	*Papaver somniferium.* Linn.
17. Peppermint	*Mentha piperita.* Smith.
18. Broom	*Cytisus scoparius.* Linn.
19. Senega	*Polygala senega.* Linn.
20. Senna	*Cassia acutifolia.* Delile.
	Cassia augustifolia. Vahl.
21. Stramonium	*Datura Stramonium.* Linn.
22. Strophanthus	*Strophanthus Komle,* Oliver.
23. Dandelion	*Taraxacum officinale.* Wiggers.
24. Valerian	*Valeriana officinalis.* Linn.
25. *Viburnum*	*Viburnum prunifolium.* Linn.
26. American Wild Cherry	*Prunus serotina.* Linn.
27. Witch *Hazel*	*Hamamelis virginica.* Linn.
28. Anise	*Pimpinella anisum.* Linn.
29. Castor Oil plant	*Ricinus communis.* Linn.
30. Camphor tree	*Cinnamomum camphora.* Nees and Eber.
31. Rhubarb	*Rheum officinale.* Linn.
32. Lavender	*Lavandula vera.* D.C.

On considering the above list, it will be readily understood that a very extensive amount of investigation will be needed before any pronouncement can be made. There are plants from every continent, and from very many latitudes, all requiring different soils and temperatures, with varying aspects and altitudes; and it will not only be satisfactory to decide that a certain plant will thrive in a certain soil and district, but to ascertain definitely how and where the plant may be grown so that it will give the best and the necessary results.

Then further consideration must be given to the economic habits of the plants themselves; for such plants as henbane and the opium poppy would be dangerous unless grown under proper supervision; while some

are even now present with us as weeds, such as the dandelion and the stramonium; others are easy of growth, like the licorice and peppermint; and it is necessary regarding the rhubarb and others to ascertain definitely the correct species and variety to be grown to give the most profitable results.

This question is also engaging the attention of the authorities in England, and last year the Board of Agriculture issued a leaflet (No. 288) on the growth of these plants. The following extracts from the pamphlet will show its character:—

Medicinal herbs have been cultivated in this country for centuries, and in the middle ages were grown in kitchen gardens attached to monastic establishments and the mansions of noblemen. At the present day farms exist at Mitcham, Carshalton, Hitchin, Ampthill, Long Melford, Steppingley, Market Deeping, and Wisbech, but for many years the main source of British drugs has been mid-Europe, particularly Germany and Austria-Hungary.

During recent years the acreage devoted to drug cultivation in Britain has been more and more restricted by competition with wild foreign products, and the result has been a slow but sure ousting of British-grown drugs from the market. The advent of the European war has completely changed the situation, and an effort on the part of growers and drug merchants may largely secure for England the collection and cultivation for the future of medicinal plants which can for the present no longer be imported from Central Europe. Supplies of drugs, especially of belladonna, leaves and root, are much in demand, but in the case of other continental drugs grown in England the shortage is not so serious.

The price of belladonna has risen seriously (more than 100 per cent.) since the outbreak of war, and as it takes at least two years to grow this drug in quantity, the drug grown next year is likely to realize high prices. This applies in lesser degree to chamomile, dill, dandelion, and valerian. The prices of colchicum, digitalis, fennel, henbane, stramonium, and botanical herbs must also be considerably affected.

The limited outlet for most drugs makes overloading the market a comparatively easy matter, and any grower who proposes to devote attention to the cultivation of medicinal plants should give the matter careful consideration before embarking on it to any serious extent. For a number of growers, however, who can successfully raise good crops, handsome profits should be made in the near future.

Co-operation.—The most important drug industry—Cinchona bark production—has witnessed quite recently the fruits of co-operation between producer and manufacturer in restricting the output within reasonable limits. So far, consumers appear to be unaffected, while all other handlers of bark and quinine, other than speculators, are in a decidedly better position. Some arrangement might perhaps be made to insure British drug growers a fair return for their efferts. Co-operation between growers and wholesale druggists would probably prove effective.

Soil and Manuring.—Soil in good condition for ordinary farm crops is suitable for growing most medicinal plants. In general, care should be taken to keep down weeds and insure a good tilth. A medium dressing of farmyard manure is usually advantageous, although not actually necessary.

Drying of Crops.—The drying of medicinal herbs is a matter of great importance, and regular growers have proper drying plant, heated artificially so that quantities of the drugs can be dried quickly and thoroughly in a current of warm air. Facilities for drying purposes are necessary to the grower of medicinal herbs. Glass houses could readily be converted into drying sheds, especially if heated by pipes. Drying can be done in half-shade in fine summer weather by spreading thin layers of the leaves on sheets in the open, or on racks or shelves in a freely-ventilated shed, turning frequently until quite dry. The leaves or flowers must be kept under cover at night or during rain. "Even colour" is best retained by quick drying, and the brighter the colour the more saleable the product. Those who intend to market dry leaves or flowers could gather and dry in small portions, which are more manageable. Roots present less difficulty in washing and drying.

The most important British drugs are dealt with briefly here, while a number of others are also mentioned, though their supply is more or less restricted.

The South of England is especially suited to drug-growing, and is further favoured in being close to the principal consuming market.

The greatest trouble to be encountered by the grower will be to obtain sufficient seeds or dormant plants to start growing medicinal herbs.

Aconite (Aconitum Napellus, L.).—The chief collecting centres for foreign aconite root are the Swiss Alps, Salzburg, North Tyrol, and Vorarlberg. Swiss supplies, which have come *viâ* Germany, may be cut off as well as the others. Supplies of Japanese aconite root are plentiful, and Spanish root is also coming into the market, so that the demand for English aconite will probably be restricted. The price of the continental root is about 50s. per cwt., and Japanese (usually ascribed to A. Fischeri, Reichb.), about 35s. per cwt., while English is ordinarily worth 2s. a lb. Cultivation of aconite has not paid in recent years, even with cultivated root four times the price of wild. Leaves are of little importance.

Belladonna (Atropa Belladonna, L.).—The bulk of the world's supply of belladonna is derived from wild plants growing in quantity on waste, stony places in Southern Europe. The industry is an important one in Croatia and Slavonia (South Hungary), some fifty exporters being engaged in buying the root and leaves from collectors and exporting the drug chiefly to Wurtemberg. The largest exporter in Slavonia sent out 29,880 lbs. of dried belladonna root in 1908.

Continued shortage will almost certainly exist during the next few years. If seeds are sown in October, a small crop of leaves may be obtained in the following year if the plants grow strongly. High prices will probably continue until the root is dug three or four years hence. It is usually difficult to obtain more than £10 per acre for a crop of belladonna, but those who contract to deliver belladonna next year should obtain more than this for the sparse first year's cutting.

Dandelion (Taraxacum officinale, L.).—Dandelion has been scarce throughout 1914. English roots have usually been sold in competition with German roots at about 40s. per cwt., but 110s. was being paid in September. In the early part of this year fresh root was worth 6s. per cwt. Unless this year's collection is much greater than usual, the

absence of German competition will keep prices high. Farmers might collect and dry the roots or arrange with the middleman for this to be done for them. An advantage of this course is that the weed is reduced.

Foxglove (Digitalis Purpurea, L.).—The continental supplies of digitalis leaves from Thuringia and the Harz Mountains are stopped; but there should be enough of the wild plant in England to satisfy home requirements if it can be collected. Dry wild leaves would be worth 35s. per cwt. and upwards. Unless these are gathered in considerable quantity there will be a shortage next year.

The foxglove is cultivated by a few growers in this country for a very limited market, in order to provide a drug of more uniform activity from a true type of digitalis purpurea.

Golden Seal (Hydrastis Canadensis, L.).—Golden seal is an American drug, the price of which has risen from 5s. per lb. in 1905 to 20s. or more in September, 1914. Such a high price enables cultivation to be practised on a commercial scale both in America and in England, even with the great expense of artificial shading in order to simulate natural conditions. Cultivation of this drug might become a paying proposition to any one who could solve the problem of the correct conditions of shade and moisture. Several times the amount of drug now used would be absorbed for making fluid extract of hydrastis and the alkaloids hydrastine and hydrastinine.

Henbane (Hyoscyamus Niger, L.).—This biennial is cultivated in this country for extract making. There is a limited demand for this purpose, and the established drug farms will probably be able to meet it. The official henbane leaves of the British Pharmacopœia are the leaves and flowering tops of the second year plants of biennial henbane, but the dry commercial leaves imported from Germany and Russia are derived from the wild annual. The plant might be grown next year to make good any shortage, if good germinable seed can be obtained. There will be a demand for dry leaves at enhanced prices next year. The normal price of the continental drug plant is 40s. to 45s. per cwt. The English-grown plant is ordinarily worth 3s. to 6s. per lb.

Opium Poppy (Papaver somniferum, L.).—The white variety of the opium poppy is still grown in several parts of the country, notably Lincolnshire, for the sake of its capsular fruits. The crop is always a precarious one, but there is a steady market for poppy heads. Belgium usually supplies a proportion of the poppy heads used in this country, but not sufficient for the loss of her crop to cause serious shortage next year.

Thorn Apple (Datura Stramonium, L.).—The thorn apple is not grown on a commercial scale in this country. The principal use of the drug is as an ingredient in burning powders for asthma, considerable quantities of wild leaves being imported from Germany and Hungary. The normal price of foreign stramonium leaves is about 40s. per cwt., but 80s. has been asked since the outbreak of war. The seed is also a commercial article, but demand is very limited. The plant is an annual, and easily grown. The dry leaves would find a ready market next year.

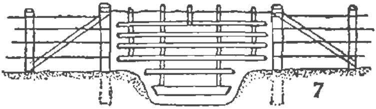
Valerian (Valeriana officinalis, L.).—Valerian is common in England in moist situations. Most of the drug plant of commerce consists of rhizomes from plants grown in Derbyshire, or imported from Holland, Germany, and France. The foreign root was selling in January at 30s.

per cwt., English being worth 1s. to 1s. 3d. per lb., about four times that price. Very little valerian is now cultivated in this country, and great scarcity already exists. Abnormal prices will be paid for some time to come.

In addition to the above, a considerable amount of space is devoted to many other plants, and to the necessities and modes of cultivation of each plant listed. It is not thought necessary to repeat those here, for conditions will probably vary considerably in Australia. It will thus be seen that, while there is every reason for the local production of these plants, and that in the near future their growth will be readily undertaken by many, it will not be wise to embark upon the undertaking of medicinal plant growing until the experimental stage has been passed. Intending growers must be prepared to take up the project, so that a considerable quantity will be produced. Buyers will neither require ounces nor pounds, but in many cases, hundredweights; and for this reason alone, it is well that the question is being investigated on a scientific basis, so that growers shall be assured success from the initial stages.

CHANNEL GATE.

A convenient water gate is illustrated in *Handy Farm Devices.* Two stout posts are set 3 feet in the ground, and about 6 feet back from the banks of the channel, well braced and stayed. A piece of plain or barbed wire is run across and back, between the posts, about six times, and fastened securely at each end. A piece of 3 x 1.



7

about 4 feet long, is placed between the two sets of wires at the middle, and turned around until the wires are well twisted together. The gate is constructed of timber, as shown in the illustration, and hung by stapling on the wires at the top.

THE POTATO MOTH.

(*Phthorimaca operculella*, Zeller. *Lita solanella*, Bois.)

RECENT SPRAYING EXPERIMENTS IN GIPPSLAND.

By C. French, Junr., Government Entomologist, and S. G. Harris, Senior Potato Inspector.

According to various writers this destructive pest of the potato crop has been known in Australia since 1854, and has spread to all the States. It has caused considerable losses to growers, and is certainly the worst potato pest in the Commonwealth. Potato moths have been exceedingly plentiful during the past two seasons, owing to the exceptionally dry weather conditions, and in Gippsland and elsewhere the damage caused by these insects has been very great. In some cases the whole crop was destroyed, when the plants were from 4 to 6 inches high, and in many instances growers had to discard fully two-thirds of the tubers when bagging owing to the depredations of the caterpillar. They are usually more plentiful after a mild warm winter. There are two broods of moths. The first, the winter brood, may destroy the young plants and thereby ruin the crops. The moths of the second brood deposit their eggs on the potatoes themselves, when the tubers are stored or are in the field. Occasionally, especially if potatoes are grown in stiff soil, the moths will crawl down the cracks into the ground and deposit their eggs on the tubers. The eggs are usually from 20 to 30 in number, and hatch in from six to ten days. In sandy soil tubers are rarely so attacked. The young grubs when hatched usually feed upon the eyes of the potatoes; they then tunnel towards the centre of the tubers, causing them to become brownish black, and inducing decay. When the potato plants have made substantial growth the female moth deposits her eggs on the leaves. The young grubs feed on these leaves and afterwards gnaw their way down to the main stalk and are distributed over the surface of the soil, occasionally reaching the tubers below, and immediately attacking and destroying all tubers exposed in the drill or scattered on the surface. Fortunately for growers, the chrysalids of the potato moth are destroyed by parasites, insectivorous birds, bacterial diseases and climatic influences.

LIFE-HISTORY.

The eggs are very minute of a white colour and glistening.

Caterpillar.—When fully grown it measures about ½ inch in length, and is of a faint pinkish colour with a brown head. It usually pupates under the skin of the potato, and is surrounded and protected by dirt, excrement, &c.

Chrysalid.—The pupa or chrysalid is dark brown in colour, and is enclosed in a silken bag or cocoon.

Moth.—The moth is small, of a light brownish grey colour, the size being, body about ½ inch in length; front wings, which are darker

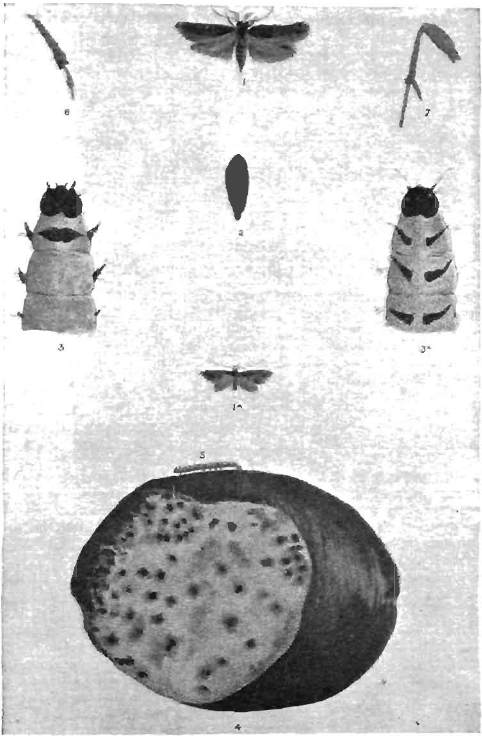


Plate V.—Potato Moth. (*Phthorimaea operculella*, **Zeller**).

EXPLANATION OF PLATE.

Fig.
I. Moth. Magnified.
IA. Moth. Natural size.
II. Pupa. Magnified.
III. Head and first three segments of larva. Upper side. Magnified.
IIIA. Head and first three segments of larva. Under side. Magnified.

Fig.
IV. Potato sliced to show effect of attack by larvæ of moth. Natural size.
V. Larva. Natural size.
VI. Fore leg. Moth.
VII. Hind leg. Moth.

than the hind ones, female, about ½ inch across when expanded, male slightly smaller. The wings of both sexes are feathery or fringy, but this is not so pronounced in the male as in the female.

PREVENTION AND REMEDIES.

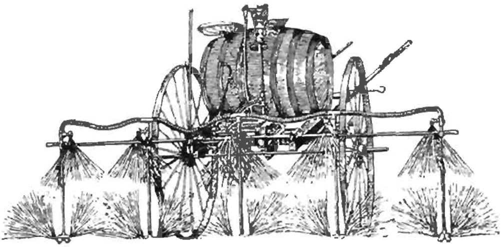
Dead potato plants, discarded and small potatoes, and rubbish should be gathered and burnt. Old sacks and cases in which there have been infected potatoes should be dipped into boiling water. By this means any grubs and chrysalids secreted in them will be destroyed. Seed infested with grubs should never be planted. Where the soil conditions will permit the sets should be planted deeply, and in shallow soil the drills should be sufficiently wide apart to allow of hilling, and as the potatoes develop there should be at all times a good depth of mould covering the top layer of tubers. When the moth is in evidence during digging operations the potatoes should not be allowed to lie on the surface, but as each stalk is dug the tubers for market and seed should be immediately gathered into the bucket or bag, and if the bag is dipped in water before being filled it will tend to close up the material and prevent the caterpillar from entering it through the spaces where it comes into contact with the soil. When the potatoes are bagged, the bags should at once be sown up and removed to the storeroom, where moths cannot get at them to lay their eggs in the eyes of the tubers. It is advisable for growers to erect bins, which could be made moth proof, and if necessary air-tight. These could be used for storing purposes, and if air-tight, for the fumigation of seed potatoes to destroy the caterpillars of the moth. Recent fumigation experiments with bisulphide of carbon have proved effectual. The quantity used is 3 lbs. of carbon bisulphide for every 100 cubic feet of air space enclosed. The potatoes should remain in the bins from four to six hours. Great care should be exercised in using this chemical, as it is highly inflammable. It is a common practice with many growers to throw a few handfuls of potato plants which are probably infested with the caterpillars of the moth over the top of the sack containing the newly dug potatoes and leave them in the field for days. The consequence is that the caterpillars are distributed throughout the contents of the bag, and tubers which have been carefully sorted for market or seed are infested with the grub. This neglect of the grower was very noticeable in parts of Gippsland which we visited this season. Another bad practice is to heap the potatoes up in the storeroom without any covering, and to leave the doors wide open. It is no wonder that losses occur.

Trapping by means of lamps is of use in destroying the moths, which fly about at night. Procure an ordinary tin basin, and in this place a brick and enough kerosene to reach half-way up the brick, and on the brick a lighted lamp. The moths are attracted to the light, and flying against the lamp fall into the kerosene, where they are destroyed. The basin could be placed on an ordinary box, such as a kerosene case. Several of these lamps could be placed in a field of potatoes at night time.

When the moths commence to make their appearance, it is advisable to spray the crop with some arsenical spray, such as arsenate of lead. This will destroy the young grubs as soon as they commence

to feed. As many reliable brands of arsenate of lead are on the market, and at a fairly cheap rate, the growers prefer to purchase the ready-made article instead of going to the trouble of mixing this excellent spray themselves. As a deterrent against moths depositing their eggs on the plants coal tar water may be used. The formula is as follows:—Boil 1 lb. of coal tar in 2 gallons of water, and while hot add from 50 to 100 gallons of water.

In cases where spraying is to be done, spaces might be left between every few rows of potatoes for the horse drawing the spray pump to pass, otherwise many of the plants will be trampled down. During a recent spraying demonstration of potatoes, this oversight on the part of the growers was very noticeable. At the present time, some excellent motor, automatic, and other spray pumps specially designed for potato spraying are on the market, the nozzles being made so that the whole plant may be thoroughly sprayed. Six or more rows of potatoes can be sprayed at the same time. Recent experiments by the writers and other officers of the department prove the value of these pumps, which are now coming into general use.



The "Fleming" Automatic Potato Sprayer.

Many reports having reached the Department of the damage caused by the potato moths this season, it was decided that experiments should be carried out to convince the growers that by early and careful spraying this pest could be kept in check. For that purpose it was arranged to conduct an experiment with an arsenate of lead spray at Iona. Most of the leading growers of the district were present. The first plot of about one acre was a strip in the centre of a field of potatoes. The land was very dirty, in some places the weeds almost covered the potato crop, and there were doubts of the result at the time of spraying, but agreeably to our surprise it was found that the result had outstripped our anticipation, and very little trace of the grub was found in the tubers; in fact, none except where they were exposed above the soil. This result was obtained despite the fact that within a chain or so where digging operations were in progress unsprayed potatoes were rather badly affected. The owner informed us that, when the crop was green, he walked through it almost every evening, and that, while the other parts of the field were swarming with the moth,

there was practically no sign of them in the sprayed part. He is quite convinced of the efficacy of the spray to destroy the moth if used under fair conditions.

The area sprayed was one acre, and the cost of the material 2s. 6d. per acre. A larger area would have been dealt with, but owing to the dry season it was difficult to obtain water for further experiments.

No. 2 plot was sprayed by the grower, Mr. Allan Macdonald, of Garfield, at a subsequent date, and comprised about three acres. He says it was a bit late when he got the machine, but after spraying the moth completely disappeared for some weeks; after a fall of rain they appeared again in small numbers, and that another spraying should then have been given, but the machine was not available. He further stated that he lost the whole of the crop last year through the moth, and is convinced, if he had sprayed, it would have meant a saving of over £400 to him. In fact, he is so favorably impressed that he intends purchasing a machine for next season.

A machine was also sent to Mr. J. Kneebone, Myrtleford, but owing to press of work we could not get away to supervise the work, but full instructions were forwarded by letter. At a subsequent date a visit was paid to the district by Mr. Harris, and it was found that the machine had also been used by Mr. Phillips, of Whorouly, but it had not been satisfactory owing to the fact that the spraying was not commenced sufficiently early. From what could be gathered from conversations with the growers mentioned, it was quite evident that had it been possible to visit the field at the time the machine was sent advice would have been given that no action be taken, as the crops were too far gone. Early spraying is necessary, and if the moths are plentiful it is advisable to spray several times. All weeds should be destroyed; this precaution is very often neglected. Many plants belonging to the Solanaceæ, especially *Solanum nigrum*, the Black Night-shade on which the moths also feed, are allowed to grow the whole year round on the potato field. If this neglect is not remedied, the growers will have the pest with them at all times. Arrangements have been made for a demonstration to be given in the district next year if the moth shows evidence of becoming troublesome.

Knapsack spray pumps can be purchased from 50s. for small plots, and motor spray pumps from £80 to £100, but the pump illustrated is the type that has been adopted, after several trials, by the Department, and can be purchased for £35 with iron droppers, and £37 10s. with copper droppers.

Where branches of the Victorian Potato and Onion Growers' Associations have been formed, the question of purchasing one or more machines by co-operative effort for joint use amongst small growers is submitted for the consideration of the executive of the Association and its branches.

As the potato moth is proclaimed an insect pest under the Vegetation Diseases Act it would be advisable that the potato inspectors should inspect all storerooms in the country districts where potatoes are grown and see that every precaution is taken by growers to protect the tubers from the ravages of this moth. One careless grower in a district can breed enough moths to ruin all his neighbours' crops, and it is against such a grower that action should be taken. In our opinion, owing to growers neglecting to keep the moth in check, potato spraying should be made compulsory.

BEE-KEEPING IN VICTORIA.

F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA (*continued*).

(*Continued from page* 486.)

THE MEALY STRINGYBARK (*Eucalyptus cinerea, F.v. M.*).

(Fig. 30. Upper part of plate.)

A moderate-sized tree, flowering already in the shrubby state, the trunk is comparatively short, with branches at from 10 to 15 feet from the ground even in aged trees; the wood is twisted and brittle, and of inferior value, the bark fibrous but not distinctly stringy, light-brown to grey outside and light-brown with a reddish tinge inside; usually only the upper branches are smooth.

The foliage has a variable whitish or ashy bloom. The leaves either stalkless and opposite, and heart to egg-shaped, as seen in the illustration Fig. 30, 1A, 1B, 5, and 6, or broad-lance and even narrow-lance shaped on short stalks, as shown at 3 and 4, or of an intermediate shape as at 6, while sucker and seedling leaves are almost round (2). The lance-shaped leaves are found more on aged trees, and become even alternate or scattered instead of opposite, but broad and lance-shaped leaves are often found on the same tree; the veins of the leaves are very spreading, not conspicuous, the marginal veins remote from the edge.

The flowers are at the shoulders of leaves in threes, only exceptionally at the end of branchlets, which latter are thin and round. The buds are half round, pointed or conical to broad conical; the fruits small, half round top-shaped, three to four, rarely five celled. This tree flowers from October to December, and although it does not perhaps rank high as a nectar producer, it is like some others, enumerated to enable the reader to distinguish it from others of greater apicultural or timber value.

The mealy stringybark is found in Victoria, in the North-Eastern district, where it is known as turpentine tree, on account of a somewhat terebinthine odour of the bark, or as silver-leaved stringybark; this name has now, however, been adopted for a variety slightly different and growing in the south-eastern parts of the State.

THE SILVER-LEAVED STRINGYBARK (*Eucalyptus cinerea variety multiflora.*)

(Fig. 31. Lower part of plate.)

A tree usually of medium size, but it may attain a height of about 100 feet, bark softly fibrous, greyish to brown outside, reddish-brown inside, and on old, stunted trees in swampy ground of great thickness in comparison with the size of the tree. Timber reddish, inferior in quality, soft short grained, and often hollow when growing on low ground.

The leaves of suckers and young saplings are broad egg-shaped (7, lower part of Fig. 31), or heart-shaped, stalkless and opposite, changing in older trees to longer and narrower short-stalked opposite (8A), or narrow lance-shaped scattered leaves (8B), but all kinds are

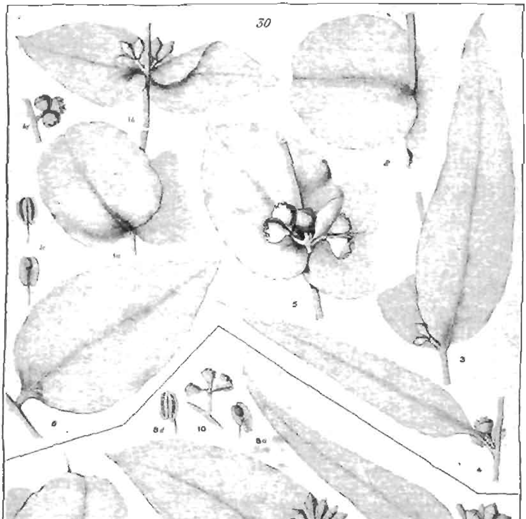


Fig. 30.—The Mealy Stringybark
(*Eucalyptus cinerea* F. v. M.). Upper part of Plate 1-6.

Fig. 31.—The Silver-leaved Stringybark
(*Eucalyptus cinerea variety multiflora*, Maiden). Lower part of Plate 7-10.

quite commonly found on the same adult tree. Young foliage, as also *buds and branchlets, frequently covered with a white or bluish bloom*, giving the tree a silvery appearance, hence the local name "Silver-leaved stringy

Flowers in umbels of four to eight at shoulders of leaves; the buds conical pointed; fruits small, half round to top shaped.

This tree appears to be confined to the eastern half of Victoria, and particularly the south-east; from the vicinity of Melbourne to Omeo and Buchan it is found in many places in districts with a good rainfall,

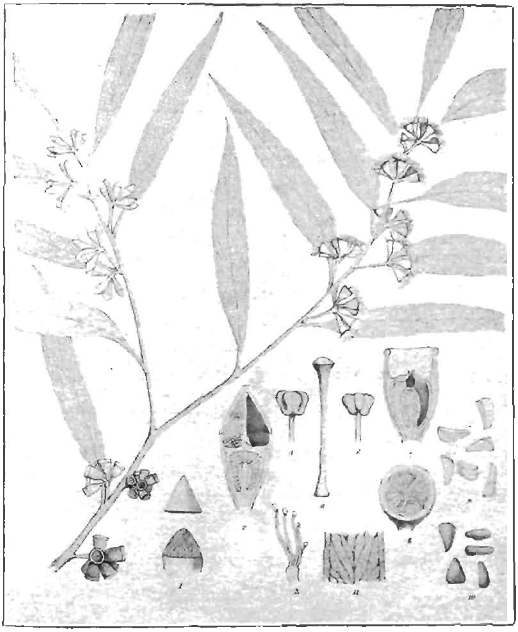


Fig. 32.—The Scented Peppermint (*Eucalyptus odorata*, Behr).

generally on poor soil on low sandy heath country, or on bayonet-grass flats (where it is often the only tree), but also on low hills, near or intermingled with messmate (*E. obliqua*) and narrow-leaved peppermint (*E. amygdalina*). As a timber tree it is almost worthless; even for fuel purposes it is inferior; but to the beekeeper in the localities where it

grows it is a valuable tree, furnishing an autumn supply of nectar and pollen, which enables the bees not only to accumulate winter stores, but often also to store surplus and always to keep up brood rearing till quite late in the season. In this respect it takes in the eastern part of the State the place of the long-leaved box (*E. elaeophora*), which is so highly appreciated by the apiarists of the drier districts, on account of the successful wintering of the bees always connected with its flowering.

The silver-leaved stringybark, which is also known by several other names, such as apple tree and red stringybark, flowers every second year from March to May or June, and is freely visited by bees even so late in the season when frosts occur at night. The honey granulates or candies somewhat coarsely, but never very hard, and although it is one of the darker kinds, it is yet one of the best flavoured of the localities producing it.

The Scented Peppermint (*Eucalyptus odorata*).

(Fig. 32.)

A medium-sized or rather small tree, with greyish rough hard box bark, hence also called box tree. It is classed as one of the peppermint trees on account of the scent of the leaves, which suggested the specific name "odorata." The timber is of fair quality, although seldom of large dimensions; it lasts well underground, is very tough, and used in a manner like that of yellow box (*E. melliodora*), of which it is an allied species; the habit of the two trees is much the same, but the scented peppermint is found chiefly on limestone ridges principally in the north-west of Victoria.

The leaves are scattered, narrow lance-shaped, rarely broad, often on comparatively short stalks, rather dull-green or somewhat shining, of equal colour on both sides; the clusters of flowers occur singly at the shoulders of leaves or in short sprays with from three to nine flowers; the buds are broad conical to pointed, half round, tapering into the short stalklet; the fruits bell-egg-shaped, three to five celled. This species appears to have been overlooked by apiarists, and, in consequence, nothing can be said regarding nectar and pollen production. It is hoped, however, that the description and illustration of this and some other eucalypts now published will be the means of obtaining this information for future use.

The Bull Mallee (*Eucalyptus Behriana*).

(Fig. 33.)

A tall shrub or small and perhaps never a tall tree, which may be said to form a connecting link between the tree eucalypts and those of a shrubby type included under the general term of Mallee.

The outer bark is brownish or dark, and shed in large flakes, leaving the surface of the stem and main branches smooth and greenish. The foliage is rather massive, leaves scattered, broadish or oval lance-shaped, of thick consistence, of equal colour and shining on both sides, not at all or only slightly curved, occasionally tinged with whitish bloom. The veins of the leaves are somewhat prominent, rather distant, the marginal vein distinctly removed from the edge of the leaf.

The clusters of flowers, seven or less in each, are in sprays; the buds are blunt or half-round ended, not angular; fruits small, cylinder-shaped or top-shaped, oval, three or oftener four celled, with a narrow rim.

In its relationship the bull mallee approaches closely to the grey-box (*E. hemiphloia*), from which it mainly differs in never attaining the stately dimensions of that species; in the bark remaining smooth from

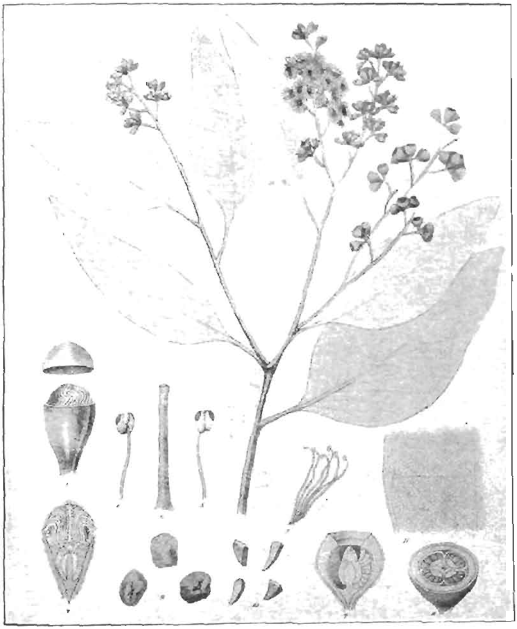


Fig. 33.—The Bull Mallee (*Eucalyptus Behriana*, F. v. M.).

the shedding of the outer layers; besides, the leaves are, as a rule (with exceptions), shorter and broader, the sprays of flowers are less ample and the flowers and fruits smaller, their stalklets shorter and the buds blunter than those of the grey box (*E. hemiphloia*).

The bull mallee (*E. Behriana*) claims also near affinity with black box (*E. bicolor*), but the bark of the latter does not shed, the leaves are

narrower, thinner, of duller hue, and finer veined, and the sprays of flowers more spreading; thus the resemblance of E. Behriana in foliage is closer to Euc. hemiphloia, but in flowers and fruits nearer to black box *(E. bicolor)*, while in bark it differs from both. It is also related to E. odorata, the scented peppermint, but the latter has a box bark, and the clusters of flowers occur at the shoulders of leaves, not in sprays.

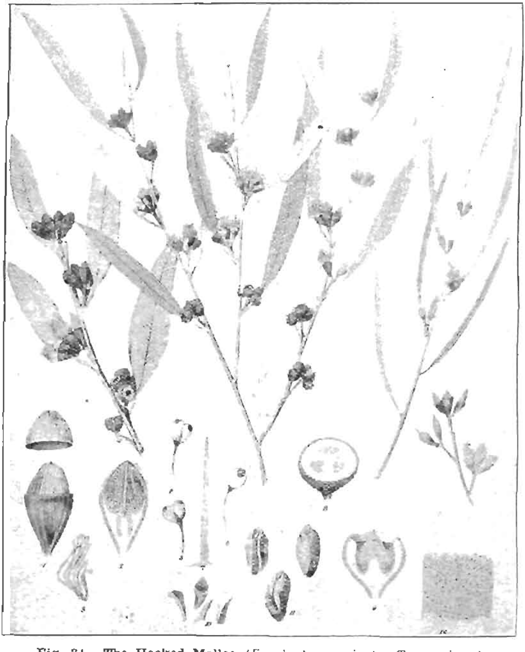


Fig. 34.—The Hooked Mallee *(Eucalyptus uncinata*, Turczaninow).

The bull mallee is found near the sources of the Werribee River, on stony hills, extending thence to the Avoca and the north-west. Nothing definite is so far known as to the character of the honey gathered from this tree, but it most likely resembles that obtained from grey-box, with which it also agrees in time of flowering and pollen production.

THE HOOKED MALLEE (*Eucalyptus uncinata*).

(Fig. 34.)

This species always remains of a shrubby growth, with several thin stems branched from near the base. It constitutes, chiefly along with the oil mallee (*E. oleosa*) and slender mallee (*E. calycogona*), a considerable portion of the Mallee scrub. The bark is smooth and greyish, or may assume on the branches and branchlets a dark hue, hence the name black mallee, by which it is known in some localities. Branches erect, never drooping. The leaves are scattered, on short stalks, usually narrow lance-shaped, of equal green on both sides and somewhat shining, occasionally they are broad lance-shaped, or very narrow and long, but always copiously dark dotted with oil glands. The veins exceedingly fine, rather close and spreading, but nowhere prominent, the marginal vein very close to the edge of the leaf which terminates (as in some other eucalypts) in a fine hooked point, from which feature in this instance the name is obtained. The clusters contain from three to nine flowers, and occur at the shoulders of leaves, or in short end sprays (occasionally), and on aged wood sideways from branchlets. The buds almost egg-shaped, but the lid sometimes narrow conical; the fruit small, half egg-shaped, mostly three, sometimes four celled.

The hooked mallee is one of those from the leaves of which eucalyptus oil is distilled.

As a nectar and pollen producer, this is one of the best of the mallee eucalypts known to beekeepers. It flowers profusely every second year during March, April, and May, lasting about twelve weeks. The buds appear three to four months before flowering.

The honey is of good quality, not very dense, but this slight defect is perhaps due only to the comparatively high humidity of the atmosphere at time of gathering, and can be rectified by running it from the extractor through a suitable heating apparatus, as is now being done by some apiarists with honey from other late flowering trees. It candies, but not solidly.

There are large tracts of the hooked mallee available for apiarists, and, as the flowering of this species alternates with that of yellow box and red gum in the western half of the State, it provides a profitable field for operations by moving the apiaries to it every second year and back to the forest country the following season.

Moreover, this particular mallee, and some others, grow chiefly on soil too poor for cultivation purposes, and the bee pasture is therefore more likely to be permanent.

(*To be continued.*)

WORKERS' COMPENSATION ACT 1914.

The Insurance Commissioner of the recently-established State Accident Insurance Office has passed on to the editor the following statement, which will be of interest to the farming community:—

It would appear that some employers—in the farming industry especially—are of the opinion that certain persons performing work for them are not "workers" within the meaning of the Act above quoted; but, on the contrary, are contractors, and therefore liability in respect of such persons under the Act is not existent, and it is not necessary to insure. It is only right, however, to remind such employers that the question of determining between a case of independent contract and the relationship of master and servant is often one of considerable legal difficulty—particularly so when the remuneration is based upon the amount of work performed, and in cases of doubt it is advisable to either effect an insurance or place the particulars of the case before the Insurance Commissioner, who will then advise the farmer as to the best course, in his opinion, to follow.

A fairly reliable test to ascertain whether the case is one of "principal and contractor," or "master and servant," is as follows:—Does the employer retain the power not only of directing what work is to be done, but also of controlling the manner of doing the work and the right of dismissal? Where this question can be answered in the affirmative, the employer may consider that there is every likelihood of his being liable under the *Workers' Compensation Act* 1914, to pay compensation for any personal injury by accident which may be sustained by a person who is engaged in carrying out the work. Under such circumstances, it would naturally follow that the necessity to insure would therefore be present.

In the case of many so-called "contracts" which are entered into by farmers for fencing, ploughing, ring-barking, potato digging, and the like, it will be found, upon an application of the foregoing test, that the arrangement made is not an independent contract at all, but instead, a "piece-work contract of service." A man who is engaged at a "piece-work" rate of pay in lieu of a daily or weekly wage is, nevertheless, a "worker" within the meaning of the Workers' Compensation Act, and requires to be insured.

Apart from a certain tendency on the part of some employers to endeavour to enter into such an arrangement as is intended to constitute the position of a "contractor," and not a "worker," may be mentioned the fact of other employers now purposely following the practice of remunerating their employees by a "share in profits" instead of weekly wages. But here, again, the employer is not on safe ground as regards immunity from liability under the Workers' Compensation Act, as it has been laid down judicially that "the question whether a person is a servant of or a partner in a firm depends upon the intention of the parties, and must be decided by the terms of the contract"; and, again, "a contract for the remuneration of a servant or agent of a person engaged in a business by a share of the profits of the business does not of itself make the servant or agent a partner in the business."

As regards the case of *bonâ fide* share farming, it is considered, on the authority of an appeal case heard before the Queensland Full Court, in October, 1910, *Korn* v. *Rano* and another, that the farmer "A," who owns land, and lets it on the share system to some other farmer "B," incurs no liability under the Act to farmer "B" or any men employed by him.

Another interesting position is that of a threshing machine proprietor who accepts contracts from farmers to cut their crops on their respective farms. Although the farmers in many instances—as part of the arrangement made—undertake to pay certain men who follow the machine on to the farm, and there get work in connexion therewith, it is not considered that the farmers incur any liability under the Act to such men, as they are really the servants of the machine proprietor while the machine is working on a farm, and he alone is liable. The mere fact of the farmer paying the wages is only a matter of arrangement with the machine owner, and is taken into account by the latter when fixing the price per ton at which the crop is to be cut. Were it not so, the contract price would be increased so as to include the cost of wages. Therefore the opinion is given that the threshing machine owner is the person liable whilst the men are actually working, and not necessarily in respect of the casual "followers" whilst they are on the road following the machine from farm to farm. The two or three permanent men (engine-driver and feeder) would, however, probably still continue their rights of recovery under the Act should they be injured by accident whilst the machine was on the roads.

The attached extracts from compensation law cases which have engaged the attention of the courts elsewhere—England, New Zealand, and Queensland principally—should prove of interest to those employers who may be labouring under a misapprehension when thinking that for a surety no liability under the Workers' Compensation Act attaches to them.

Mr. Holmes has intimated to the Editor his willingness to answer any inquiries in writing that employers may feel disposed to address to him upon the subject of liability under the Act. The address of the State Accident Insurance Office is: Oxford Chambers, 473-481, Bourke-street, Melbourne.

Employers are advised in their own interests to take advantage of the fact that the Government has provided them with an insurance office whose aim will be to afford them insurance under the Act at cost price. This course is only possible for the reason that the office is not expected to be a revenue producer, and any profits which may be made by the office are to be refunded to the policy-holders by a system of periodical rate revision and distribution of profits. At the same time, too, it is the intention to judge each separate policy and class of occupation on its own individual merits, so that a careful employer who adopts safeguards to minimise accidents will be rewarded, and not penalized, by having to "carry" the careless employer. Employers who are interested by the foregoing should write to the Insurance Commissioner for further particulars, or a copy of the balance-sheet of the first year's operations of the office.

EVANS V. THE PENWYLLT SILICA BRICK COMPANY (England).

It was held that a worker who was employed under a written agreement on the terms that he should be paid so much for every ton of material which he worked, was a worker at piece rate.

BAGNALL V. LAHEYS LIMITED (Queensland).

A man was engaged to cut scrub at 7s. per day, and afterwards the employer let him a section of pine to fell at 6s. per 100 feet, and 1d. per 100 feet bonus, as the section was completed. The employer directed into what lengths the pine was to be cut. No time was fixed for completion, and the employee could commence and cease work when he chose, but was bound to keep the mill supplied, the employer being the arbiter of the sufficiency of the supply. He could, if he chose, employ other labour, and he used his own tools. On several occasions while thus occupied he was directed to work otherwise, at 7s. a day. While engaged in felling pine an accident happened to the employee. It was held that he was a worker.

*HERBERT V. EDELSTON** (Queensland).

By a verbal contract Edelston agreed to ring-bark 200 acres of land on piece-work, at a remuneration of 1s. 3d. per acre, payable on the completion of the work, for which no time was fixed. Edelston was at liberty to begin work when he wished. Herbert showed Edelston in what manner he wanted the work done, and pointed out certain trees which were to be left untouched. Edelston engaged others to assist in the ring-barking, probably to the knowledge of Herbert. While engaged in this work Edelston's axe glanced from a tree and injured his knee. It was held that there was evidence from which it could be found that Edelston was a worker within the meaning of the Workers' Compensation Act (Q.) of 1905.

PENROSE V. POWELL (New Zealand).

Where the claimant was engaged in felling an unspecified area of bush to clear the land for farming purposes, at so much an acre, and was subject in all respects to the directions of the respondent. He was not a contractor, but was a piece-worker, and was within the Act.

MOONEY V. SHEEHAN, 1903 (Ireland).

A carter, who found his own horse and cart, and was engaged to carry hay at 9d. a ton, was in Ireland held to be a worker engaged by piece-work.

SMITH V. HORLOCK (England).

The applicant was employed as the master of a barge, on the terms that he was to receive half the net freights and to engage and pay the mate and boy, the owner only paying 5s. a week towards the boy's wages. It was a term of his employment that the owner was to fix the freight, and as regards the only voyage made by the applicant the freight had actually been arranged before he was engaged. The applicant had no choice where to go, but received orders as to his destination and places of call. The applicant said he was not liable to dismissal during a voyage. In an account sent by the owner to the applicant a deduction was made from the amount shown as due to the applicant in respect of his insurance under the *National Insurance Act* 1911. *Held.*—That the County Court Judge had not been justified in holding that the applicant was a co-adventurer, and not a workman within section 13 of the *Workmen's Compensation Act* 1906, and that the case must be remitted to him to assess the compensation.

JONES V. PENWYLLT DINAS SILICA BRICK COMPANY (England.)

A workman having been killed while working in a quarry, his widow claimed compensation from the company owning the quarry. It appeared that the deceased was paid by the company a fixed sum on each ton of stone sent out. He had taken another man into partnership, and they had under them several men who were employed by the day. The company provided the necessary tools, trams and rails, and also a horse. The deceased had to feed the horse and to

buy gunpowder from the company for blasting purposes. When the company's manager required a particular kind of stone, he gave orders for it, and he could order the refuse or *débris* to be removed to any particular place. The manager said *that if the deceased had failed to do as instructed he would have received* reasonable notice to terminate the contract. Subject to this, the deceased could work as he pleased, provided he did not damage the quarry. *Held.*—That there was evidence to support the finding of the County Judge that the deceased was a workman within the meaning of section 13 of the *Workmen's Compensation Act* 1906.

BOYD V. DOHARTY (England).

A was engaged to break stones for road metal at a fixed rate per cubic yard by B, who had a contract for the supply of road metal with a county road authority, and who provided A with material. A was injured whilst engaged on the work, and claimed compensation from B. The sheriff-substitute found that A was under B's orders as to where he should work, and was subject to dismissal by him. It was held that A was a workman.

REED V. SMITH, WILKINSON AND CO. (England).

The respondents were owners of a threshing machine which they let out on hire to farmers. They were bound by statute to have three men to attend the machine, two to look after the engine, and a third as a "road man." At farms the road man acted as assistant in the threshing, being paid for this by the farmer, and not by the respondents.

While engaged in the threshing the applicant, the "road man," was injured, and claimed compensation from the respondents, who denied liability, stating the farmer was employer.

The County Court Judge held the respondents were the employers.

The Appeal Court held: that the County Court Judge had decided a question of fact, and *that there was evidence to support his decision.*

ELTRINGHAM V. BROWN (Victorian case). Ballarat County Court, June, 1915.

Brown was the owner of a threshing machine in connexion with which he accepted contracts from farmers. Eltringham was employed by him on different farms. Whilst the machine was leaving the farm of one Allan, a mishap occurred at the gate of the farm. Eltringham went forward to chock the wheel, and whilst doing so was injured. The Judge held that at the time of the accident Eltringham was not in the course of his employment, and therefore decided in favour of the employer.

NOTE.—This case is interesting from two points of view: First, the proprietor and not the farmer was unquestionably regarded as the employer; and secondly, the employment of the casual "followers" ceases when the machine commences to travel away from a farm. This decision is apparently justifiable and correct, and will form a precedent for the future.

BURNT lime may weigh from 70 lbs. to nearly 1 cwt. per bushel. Good lime is lightest.

IN 1901-2 there were 23,535 tons of artificial manure used in Victoria. Nine years later the quantity was 86,316 tons.

VICTORIAN RAINFALL.

Second Quarter; Year 1915.

During the second week of April some very appreciable falls of rain occurred in connexion with thunderstorms due to moonsoonal activity, and later an Antarctic depression passed over bringing good general rains to southern areas. These falls dispelled all anxiety south of the Dividing Range with regard to prospects for the coming season; but the amount of rain received in northern districts was not sufficient even for their present requirements. About the middle of the following month good general rains set in, and lasted about a week, followed by showers later. Some of the rivers then commenced to flow, and the droughty conditions disappeared—and one of the most severe droughts ever known in the history of the State terminated. The following month (June) was an exceedingly wet one; the rainfalls were extremely beneficial, and the days during which the falls continued were numerous. The heaviest rains occurred along the west coast and the Wimmera districts. The Southern Mallee fared much better than the northern parts, but East Gippsland did not participate to the same extent as the remainder of the State in the copious rains due to the Antarctics. All rivers and creeks throughout the State are now flowing, and crops growing well except in a few isolated cases, where early-sown crops are somewhat patchy. Grass is not growing up to anticipations, and the coldness of the weather had a very serious effect on stock, especially the poorly-conditioned and weak ones, many of which succumbed, they being too low to withstand the piercingly cold winds and the falling temperatures.

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	54	109	115	278
	Normal	74	100	151	325
	Per cent. above normal	..	..	..	..
	,, below ,,	27	9	24	42
Mallee South	District Mean.. ..	70	124	193	387
	Normal	114	139	181	434
	Per cent. above normal	..	..	7	..
	,, below ,,	39	11	..	43
North Wimmera ..	District Mean.. ..	99	141	333	573
	Normal	127	167	217	511
	Per cent. above normal	..	..	53	15
	,, below ,,	22	16	..	..
South Wimmera ..	District Mean.. ..	98	158	517	773
	Normal	162	203	275	640
	Per cent. above normal	..	..	88	22
	,, below ,,	40	22	..	..
Lower Northern Country	District Mean.. ..	80	206	206	492
	Normal	131	159	204	494
	Per cent. above normal	..	30	1	..
	,, below ,,	39	..	..	8

VICTORIAN RAINFALL—*continued.*

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
Upper Northern Country	District Mean.. ..	93	262	285	640
	Normal	165	204	271	640
	Per cent. above normal	..	28	52	36
	,, below ,,	44	..	..	..
Lower North-East ..	District Mean.. ..	94	479	522	1,095
	Normal	197	240	383	820
	Per cent. above normal	..	100	36	84
	,, below ,,	52	..	..	..
Upper North-East ..	District Mean.. ..	208	564	796	1,568
	Normal	274	366	609	1,249
	Per cent. above normal	..	54	31	61
	,, below ,,	24	..	..	..
East Gippsland ..	District Mean.. ..	97	187	129	413
	Normal	253	241	319	813
	Per cent. above normal	..	..	..	..
	,, below ,,	62	22	60	144
West Gippsland ..	District Mean.. ..	224	411	332	967
	Normal	299	278	351	928
	Per cent. above normal	..	48	..	18
	,, below ,,	25	..	5	..
East Central	District Mean.. ..	357	460	348	1,165
	Normal	291	301	350	942
	Per cent. above normal	23	53	..	75
	,, below ,,	..	..	1	..
West Central	District Mean.. ..	177	256	271	704
	Normal	201	207	224	632
	Per cent. above normal	..	24	21	33
	,, below ,, ..	12	..	..	..
North Central ..	District Mean.. ..	176	320	418	914
	Normal	194	243	325	762
	Per cent. above normal	..	32	29	52
	,, below ,, ..	9	..	..	..
Volcanic Plains ..	District Mean ..	153	228	377	758
	Normal	198	245	298	741
	Per cent. above normal	..	..	27	..
	,, below ,, ..	23	7	..	3
West Coast	District Mean.. ..	177	346	671	1,194
	Normal	255	297	371	923
	Per cent. above normal	..	16	81	66
	,, below ,,	31	..	..	..

N.B.—100 points = 1 inch.

22nd July, 1915.

H. A. HUNT,
Commonwealth Meteorologist.

SUMMARY OF RUTHERGLEN WEATHER.

C. Blazey, M.Sc. B. Ag.Sc. Field Officer, Rutherglen Experiment Farm.

These figures apply to years 1908-1915, *i.e.*, 7½ years, and are taken from the College Record Book.

Altogether there have been 650 wet days—an average of 86.66 per year.

In the following tables the direction of the wind is that given at 9 a.m. daily, and may be taken as indicating fairly the wind for the day. A difficulty arises when it is assumed that because the wind is recorded, say, as North at 9 a.m. on any particular day, the rain which has previously fallen has come from that direction. For instance, if, during the early morning, rain falls from the West, the wind may swing round to the south by 9 a.m. However, on the whole, the 9 a.m. wind record is a fair indication of the direction from which the preceding rain has fallen, as an examination of the Record Book shows:—

TABLE 1.

Number of days on which rain has fallen from the following directions:—

S.E.	E.	N.E.	N.	N.W.	W.	S.W.	S.
82	52	338	14	29	26	87	22

TABLE 2.

Total rain from following directions (points):—

	S.E.	E	N.E.	N.	N.W.	W.	S.W.	S.
Total number of points	1,594	865	8,524	409	1,000	625	2,057	241
Percentage of total rain.	10·41%	5·65%	55·66%	2·67%	6·53%	4·08%	13·43%	1·57%

TABLE 3.

Average fall in points from following directions, and number of falls over 1 inch and 50 points:—

	S.E.	E	N.E.	N.	N.W.	W.	S.W.	S.
Average fall in points (for one day).	19·4	16·6	25·2	29·2	34·5	24·0	23·6	11·0
Falls of more than 1 inch for one day.	—	1	11	1	2	1	3	—
Falls of more than 50 points for one day.	8	5	54	3	8	4	10	1

TABLE 4.

Average monthly fall in inches:—

Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1·14	1·08	2·28	1·20	2·03	2·82	2·14	1·73	1·78	1·63	1·64	1·28

Average yearly fall, 20.75.

SUMMARY.

1. *In every month most of the rain comes from the N.E.*

2. For the last seven and a half years nearly 56 per cent. of the rainfall has been from this direction.

3. In summer, wind from the E. or N.E. means warm (hot) weather, and rising temperatures. Heavy rains come from the N.E. both summer and winter.

4. Wind from the N.W., W. or S.W. often means boisterous weather summer and winter. Rain from these quarters is generally showery. *In summer, when the wind gets round to the S. W. or S., the temperature* generally drops.

5. Easterly rains are few and light. At Beechworth, Tallangatta, &c., rains from this direction are often heavy, but seldom reach Chiltern or Rutherglen.

VICTORIAN AGRICULTURAL STATISTICS.

AREA UNDER OATS, 1915-16.

Estimated Area under Oats, Season 1915–16 (based on information furnished by Farmers).

Counties.	Area under Oats (Grain and Hay), 1914–15.	Estimated Area under Oats (Grain and Hay), 1915–16.
	Acres.	Acres.
Bourke	83,990	96,800
Grant	110,015	133,500
Dalhousie	24,494	26,100
Talbot	45,491	53,600
Grenville	37,279	44,200
Ripon	35,677	39,800
Lowan	76,463	83,900
Borung	109,851	108,700
Kara Kara	45,009	55,400
Karkarooc	54,921	43,100
Tatchera	36,042	44,400
Gunbower	24,912	33,600
Gladstone	35,755	48,300
Bendigo	30,992	50,200
Rodney	29,936	44,300
Moira	39,562	59,900
Delatite	27,757	30,000
Bogong	26,517	29,900
Buln Buln	34,635	43,600
Other counties	203,412	254,700
Total	*1,112,710*	*1,324,000*
Grain area, 1914–15 ..	434,815	..
Hay area, 1914–15 ..	677,895	..

VICTORIAN AGRICULTURAL STATISTICS—*continued.*

AREA UNDER WHEAT, 1915-16.

Estimated Area under Wheat, Season 1915–16 (based on information furnished by Farmers).

Counties.	Actual Area under Wheat (Grain and Hay), 1914–15.	Estimated Area under Wheat (Grain and Hay), 1915–16.
	Acres.	Acres.
Grant	16,675	32,800
Talbot	31,296	44,200
Grenville	34,653	46,500
Hampden	22,461	30,800
Ripon	77,683	99,700
Lowan	201,350	264,300
Borung	407,549	595,700
Kara Kara	168,820	229,200
Weeah	181,192	231,300
Karkarooc	500,708	649,200
Tatchera	338,143	473,400
Gunbower	66,760	88,300
Gladstone	159,705	208,300
Bendigo	198,105	257,100
Rodney	153,925	205,900
Moira	358,149	506,300
Delatite	19,651	33,000
Bogong	54,339	72,000
Other counties	54,933	91,800
Total	3,056,097	4,160,800
Grain area	2,863,535	3,810,800
Hay area	192,562	350,000

Stocks of Wheat and Flour in Victoria on 30th June, 1915, compiled from information received from Holders.

Where Located.	Wheat.	*Flour (Equivalent in Wheat).	Total
	Bushels.	Bushels.	Bushels.
On railway stations and in transit ..	15,427	14,200	29,627
On sites leased from railways	120,164	49,700	169,864
In mills and stores (other than those on railway premises)	234,852	446,400	681,252
On farms	212,005	..	212,005
Total	582,448	510,300	1,092,748

* Exclusive of quantities held in small bakeries and by storekeepers.

VICTORIAN AGRICULTURAL STATISTICS—*continued.*

AREA AND PRODUCE OF POTATOES, ONIONS, AND MAIZE, 1913–14 AND 1914 15.

Principal Counties.	Area in Acres.		Produce.			
			Total.		Average per Acre.	
	1913–14.	1914–15.	1913–14.	1914–15.	1913–14.	1914–15.
Potatoes.						
			Tons.	Tons.	Tons.	Tons.
Bourke .. .	7,951	6,508	18,307	15,176	2·30	2·33
Grant	10,557	8,898	23,942	24,848	2·27	2·79
Mornington	11,276	12,372	31,209	45,334	2·77	3·66
Evelyn	1,388	1,342	3,092	4,078	2·23	3·04
Dalhousie	3,840	3,228	6,239	7,609	1·62	2·36
Talbot	8,872	6,804	15,269	17,669	1·72	2·60
Grenville	1,648	1,063	3,174	3,012	1·93	2·83
Polwarth	1,354	1,306	3,064	2,947	2·26	2·26
Ripon	1,953	1,344	2,595	2,591	1·33	1·93
Villiers .. .	5,708	5,392	20,870	15,347	3·66	2·85
Normanby	2,475	1,926	6,097	4,117	2·46	2·14
Delatite	1,380	1,198	2,624	1,861	1·90	1·55
Buln Buln	8,031	8,393	23,173	34,794	2·89	4·15
Remainder of State ..	8,141	5,721	16,947	9,842	2·08	1·72
Total ..	74,574	65,495	176,602	189,225	2·37	2·89
Onions.						
			Tons.	Tons.	Tons.	Tons.
Bourke	1,118	1,157	4,014	4,117	3·59	3·56
Grant	740	1,199	2,405	3,116	3·25	2·60
Mornington	547	1,244	2,407	5,794	4·40	4·66
Grenville	1,570	2,134	5,636	4,826	3·59	2·26
Polwarth	594	803	3,065	2,737	5·16	3·41
Villiers . ..	609	1,039	3,483	3,688	5·72	3·55
Buln Buln	566	937	2,168	6,072	3·83	6·48
Remainder of State ..	377	424	1,577	1,178	4·18	2·78
Total ..	6,121	8,937	24,755	31,528	4·04	3·53
Maize.						
			Bushels.	Bushels.	Bushels.	Bushels.
Delatite	1,095	1,120	26,076	13,328	25·64	11·90
Bogong	974	1,088	21,525	15,820	22·10	14·54
Croajingolong ..	2,121	3,023	114,789	218,986	54·12	72·44
Tambo	3,144	3,311	195,840	248,789	62·29	75·14
Dargo	4,015	3,556	177,102	209,413	44·11	58·89
Tanjil	4,960	5,056	209,461	260,586	42·23	51·54
Buln Buln	379	502	13,401	20,391	35·36	40·62
Remainder of State ..	1,274	1,777	40,335	31,106	31·66	17·50
Total ..	17,962	19,433	800,529	1,018,419	44·57	52·41

Office of the Government Statist,
Melbourne, 4th August, 1915.

A. M. LAUGHTON,
Government Statist.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.8.15	15.8.15 to 14.9.15	Five months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
53	White Leghorns	W. G. Swift	505	155	660	1
21	„	*E. B. Harris*	*511*	*146*	*657*	2
38	„	G. McDonnell	503	145	648	3
19	„	L. G. Broadbent	489	157	646	4
5	„	J. J. West	484	154	638	5
2	„	E. A. Lawson	490	144	634	6
34	„	*H. McKenzie and Son*	*472*	*153*	*625*	7
8	„	C. J. Jackson	467	143	610	8
10	„	A. E. Tuttleby	461	145	606	9
42	„	W. M. Bayles	456	147	603	10
9	„	J. Schwabb	462	137	599	11
6	„	F. Doldissen	460	137	597	12
7	„	Marville Poultry Farm	459	136	595	13
26	„	A. Mowatt	441	144	585	
16	„	N. Burston	456	129	585	
44	„	Mrs. F. M. Oliver	433	143	576	16
18	„	D. Adams	444	123	567	17
4	„	R. Hay	423	133	556	18
30	„	A. E. Silbereisen	410	142	552	19
32	„	F. Hodges	419	133	552	
60	„	B. C. Brock	418	132	550	21
39	„	W. M. Sewell	396	152	548	22
1	„	Mrs. H. Stevenson	402	141	543	23
50	„	John Hood	403	130	533	24
25	„ (5 birds)	Giddy and Son	415	118	533	
11	„	*J. B. Brigden*	*390*	*141*	*531*	26
3	„	J. H. Gill	386	141	527	27
54	„	W. G. Clingin	374	153	527	
24	„	Lysbeth Poultry Farm	389	137	526	29
59	„	W. G. Osburne	371	151	522	30
49	„	Bennett and Chapman	392	127	519	31
13	„	T. Hustler	372	140	512	32
33	„ (5 birds)	A. W. Hall	379	133	512	
28	„	R. Lethbridge	378	133	511	34
23	„	Fulham Park	372	136	508	35
48	„	C. J. Beatty	364	143	507	36
15	„	H. N. H. Mirams	378	119	497	37
55	„	W. N. O'Mullane	354	139	493	38
57	„	B. Mitchell	360	118	478	39
47	„	J. C. Armstrong	331	137	468	40
52	„	A. A. Sandland	349	118	467	41
20	„	R. W. Pope	321	144	465	42
27	„	J. A. Stahl	307	152	459	43
43	„	H. I. Merrick	336	115	451	44
12	„	G. Hayman	305	141	446	45
58	„	Thirkell and Smith	313	131	444	46
41	„	J. A. Donaldson	315	126	441	47
45	„	South Yan Yean Poultry Farm	318	121	439	48
36	„	*Weldon Poultry Yards*	319	113	432	49
46	„	R. Berry	300	130	430	50
22	„	S. Buscumb	280	149	429	51
40	„	C. C. Dunn	314	114	428	52
37	„	A. Ross	277	122	399	53
14	„	*W. Flood*	*305*	*73*	*378*	54
56	„ (5 birds)	C. Hurst	259	113	372	55
31	„	L. McLean	196	125	321	56
			21,683	7,554	29,237	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915–16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.8.15.	15.8.15 to 14.9.15.	Five months.	Position in Competition.
		LIGHT BREEDS. DRY MASH.				
80	White Leghorns ..	W. H. Robbins	561	152	713	1
68	,, ..	H. McKenzie and Son ..	423	151	574	2
69	,, ..	E. MacBrown	450	123	573	3
78	,, ..	H. Hanbury	429	127	556	4
64	,, ..	*W. M. Bayles*	419	135	554	5
70	,, ..	Lysbeth Poultry Farm ..	393	148	541	6
72	,, ..	Mrs. E. Zimmerman ..	394	136	530	7
66	,, ..	E. A. Lawson	376	147	523	8
63	,, ..	*A. H. Padman*	*349*	*158*	*507*	9
76	,, ..	A. A. Sandland	363	140	503	10
65	,, ..	Thirkell and Smith ..	339	135	474	11
62	,, ..	Benwerren Egg Farm ..	313	150	463	12
61	,, ..	Mrs. H. Stevenson ..	301	157	458	13
67	,, ..	C. C. Dunn	318	135	453	14
71	,, ..	Moritz Bros.	320	128	448	15
77	,, ..	South Yan Yean Poultry Farm	218	141	359	16
73	,, ..	C. L. Lindrea	200	153	353	17
74	,, ..	J. H. Gill	240	107	347	18
75	,, ..	*Fulham Park*	237	91	328	19
		Total	6,643	2,614	9,257	
		HEAVY BREEDS. WET MASH.				
97	Black Orpingtons ..	Marville Poultry Farm ..	507	156	663	1
100	,, (5 birds)	J. H. Wright	524	134	658	2
86	,, ..	C. E. Graham	476	173	649	3
81	,, ..	Mrs. T. W. Pearce ..	515	129	644	4
85	,, ..	H. H. Pump	445	147	592	5
90	,, (5 birds)	Oaklands Poultry Farm ..	455	121	576	6
88	,, ..	J. McAllan	420	150	570	7
94	,, *(5 birds)*	*D. Fisher*	*450*	*117*	*567*	8
89	Rhode Island Reds	E. W. Hippe	413	149	562	9
93	Black Orpingtons ..	L. W. Parker	390	155	545	10
99	,, ..	L. McLean	392	137	529	11
87	,, ..	W. C. Spencer	390	133	523	12
91	,, ..	A. Greenhalgh	366	124	490	13
84	,, ..	Cowan Bros.	352	131	483	14
95	Silver Wyandottes ..	W. H. Forsyth	351	123	474	15
92	Black Orpingtons ..	J. Ogden	308	145	453	16
96	White Orpingtons ..	Stranks Bros.	349	81	430	17
83	Black Orpingtons ..	G. Mayberry	272	114	386	18
98	Faverolles ..	K. Courtenay	226	134	360	19
82	White Wyandottes	J. B. Brigden	104	128	232	20
		Total	7,705	2,681	10,386	

Report for Month Ending 14th September, 1915.

The weather conditions for the month were seasonable, a great deal of north-west wind with light rains alternating with fine, clear days. The birds are in excellent condition, and laying very fast. (The week ending 16th September was the highest figures for one week's laying yet done at Burnley.) One hen died during the month, and a number were broody. The rainfall for the month was 174 points.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

REMINDERS FOR NOVEMBER.

Live Stock.

HORSES.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

CATTLE.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Beware of milk fever. Read up method of treatment in *Year-Book of Agriculture*, 1905. Have cows' milk weighed and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Give calves a warm dry shed and a good grass run. Keep calves' premises scrupulously clean and regularly disinfected with Phenyle or *Condy's Fluid. Feeding vessels must be kept clean. Skim milk should be* scalded, unless it is known that the cows are healthy. Give the calves a regular quantity, and do not overfeed. Better too little than too much. Give milk at *blood heat. Dehorn all calves, except those required for stud or show purposes.*

PIGS.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Read articles on breeding and feeding and housing in *Journals*, April, 1912, June, 1913, and May, 1915.

SHEEP.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where the lice have been bad. Hold sheep in the bath not less than half a minute: if badly infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip full grown sheep first, lambs last. Yard sheep over night. Dip while empty, and avoid fouling the drainer so much. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas.

POULTRY.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

Cultivation.

FARM.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

ORCHARD.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

VEGETABLE GARDEN.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

FLOWER GARDEN.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

VINEYARD.—*Field grafts require careful attention in the way of removal of* suckers and scion roots. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible *during summer. Proceed with tying up, stopping and topping. Avoid excessive* topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply *second sulphuring just before blossoming, wherever Oidium was prevalent last* year.

Cellar.—Same as last month.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 11. 10th November, 1915.

TEACHERS' FARM SCHOOL.

STATE RESEARCH FARM, WERRIBEE.

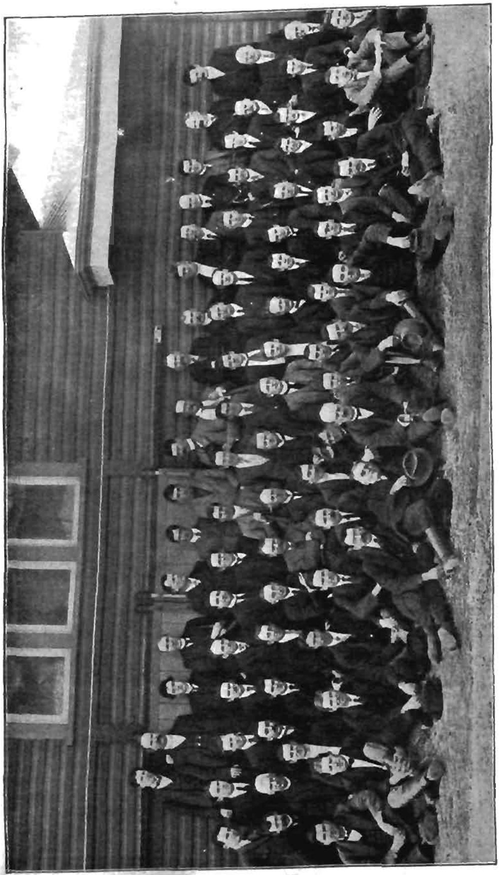
September 20th-24th.

It is an old and true saying that "There is nothing new under the sun," and yet the policy of the Department of Agriculture in disseminating the latest in scientific agriculture and agricultural research to school teachers of the State blazes a new track.

Since the installation of the Research Farm at Werribee, the Department has thoughtfully catered for the farming community in the matter of educating the farmer. In the past, the scheme was to arrange a farmers' excursion during Show Week, visitors being conducted by Dr. Cameron, Director of Agriculture, and staff over the farm. The Royal Show this year was abandoned, and consequently the farmers' field day could not be held. In lieu thereof, a programme of lectures and demonstrations for those State school teachers who included agriculture in their curriculum was arranged by the Departments concerned.

On the occasion of the annual field day, representative farmers from all parts of Victoria had the opportunity of viewing experiments associated with the cultivation of the main cereal and fodder crops, the breeding of wheat, the cultivation of lucerne, and other agricultural problems. The details of every separate experiment were explained to them. The objective was that the lessons learned there would be spread broadcast in various districts. The work of the farm, which is essentially and directly an institution devoted to scientific agriculture, would become known and utilized by the particular part of the community in whose interests everything is being done.

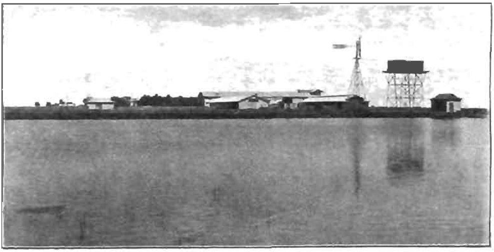
This year's innovation, in a manner of speaking, hits much nearer home. The position of the local schoolmaster is not generally one to be envied, especially in rural districts. His services are in frequent



Group of Teachers attending the Farm School, State Research Farm, Werribee, September, 1915.

request for filling in census cards, making up income tax returns, advising on electoral matters, dealing with questions on law and finance, acting as arbitrator in disputes, and umpiring football and cricket matches; in fact, he is the encyclopædia of the district. In agriculture, he is often asked questions ranging from the correct method of telling a horse's age to the percentage of flour a given wheat will produce. It is an old saying to "teach a yard you must know a mile"; hence it follows that a successful tutor in agriculture must possess more than a passing knowledge of the various mechanical arts and applied sciences which are attendant upon modern agriculture. He must also have a keen grip of practical agriculture. A day spent at the School of Agriculture during the course of the five days' instruction helps one to understand the value of the lectures and demonstrations given.

Upwards of seventy school teachers took advantage of the arrangements made by the Departments of Agriculture and Education. The school, which, by the way, was not run under union principles, as lectures and practical demonstrations in the field were held daily and



View of Farm Buildings, with Water Storage in the Foreground.

continuously from 9 a.m. to 10 p.m., with meal adjournments, was installed in the Werribee Research Farm buildings, and opened officially on Monday, 20th September. The large machinery-shed was turned into comfortable dormitories with novel, serviceable yet cheap conveniences. The dining-room was situated in a large and airy storeroom under the lecture-room in the laboratory building.

The meals were of the first-class order, and the tariff very reasonable.

Formal Opening.

On Monday afternoon, the school was formally opened by Dr. S. S. Cameron, Director of Agriculture, and addresses were given by Mr. W. Cattanach, Chairman of the State Rivers and Water Supply Commission; Dr. Cherry, Professor of Agriculture at the Melbourne University; and Mr. Fussell, Chief Inspector of Schools. In the evening, addresses were given by Professor Osborne, on "The Human Body as an Engine," and the Hon. F. Hagelthorn, M.L.C., on "Agricultural Efficiency."

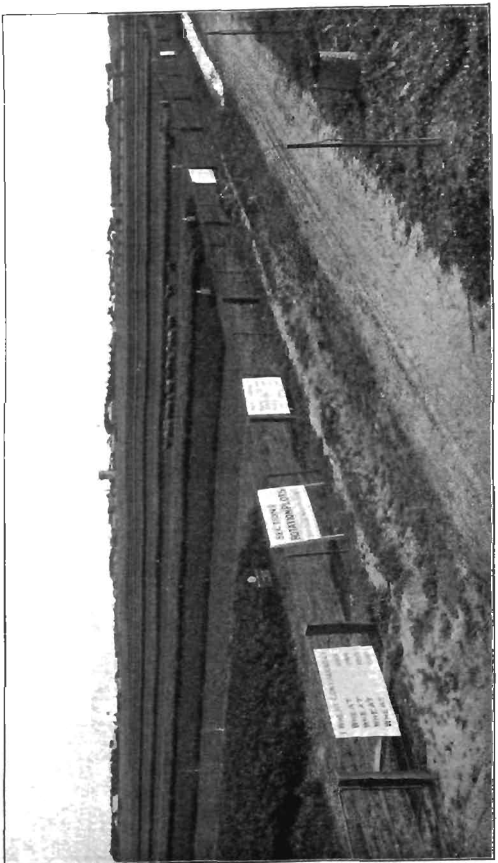
OPENING ADDRESS.

Dr. S. S. Cameron, Director of Agriculture, in formally opening the school and welcoming the class, apologized for the absence of the Minister of Agriculture (Mr. Wm. Hutchinson, M.L.A.), and the Minister of Education (Mr. T. Livingston, M.L.A.), both of whom had intended to be present, but were detained at an important Cabinet meeting. He also regretted the absence of Mr. Frank Tate, Director of Education, who could have conveyed more properly, and infinitely more interestingly, the objects it was desired to achieve by the holding of these classes, and who, until his departure for Queensland on a well-earned holiday, had taken an earnest personal interest in arranging the course.

Although it was but natural that at the inauguration of this Teachers' Farm School a representative of the Education Department, in the person of Mr. Fussell (Chief Inspector), should be present to extend a word of welcome to those who were devoting their holiday to the acquirement of a wider range of knowledge, the presence of the Chairman of the Water Commission (Mr. W. Cattanach), and the Professor of Agriculture, in the Melbourne University (Dr. Cherry), had an important significance. Each of the bodies thus represented had a profound interest in the progress of agriculture; each was concerned, though in somewhat different ways, with the advancement of agriculture, and each owed a duty to the State to promote and push with the fullest energy and by every means in their power the betterment of agricultural methods, to the end of an increased and more profitable output from the fair lands of Victoria. It was plain that such objects would be best attained by the bodies concerned acting in unison. Such unison had not been too conspicuous in the past, but in connexion with this effort to assist agricultural education there was manifestation of cordial collaboration and co-operation of the State Departments of Education and Agriculture, and also of the hearty good-will and personal interest of the University and the Water Commissioners.

It was well known that the agricultural educational work carried out in Victoria had been somewhat disjointed. There were some who said that as yet it had been inarticulate, *i.e.*, it had not spoken. While that idea might be properly challenged, it could be agreed that the agricultural educational efforts had been non-articulating in the sense that they had not fitted in and worked smoothly together. Theoretically the apparent scheme was a good one. It provided firstly, elementary agricultural education in upwards of 500 of the primary schools; secondly, more advanced work in the twelve Agricultural High Schools; thirdly, a three-years' diploma course devoted solely to agriculture in the agricultural colleges at Dookie and Longerenong; and finally, a full university course for a science degree in agriculture. All these were designed to educate the youth of the community, and, in addition, the Department of Agriculture undertook, per medium of district farmers' classes, lectures and demonstrations, the instruction of the farmers of the State. Such a scheme appeared to offer the opportunity of stepping stage by stage from the preliminary grounding given to the schoolboy to a university graduation in agricultural science; yet, so far, there was no instance of such a career having been passed through. The experience here as elsewhere showed that efforts to promote agricultural education among fully-fledged farmers was only occasionally successful.

The minds of grown men who had for some years been engaged in practical farming became too inflexible. They had the handicap of having to unlearn a great deal before they could appreciate the soundness of modern investigations and science teachings. The most hopeful direction, therefore, in which the promulgation of scientific methods of agricultural practice could be effected was through the young unprejudiced mind of boyhood and youth. It followed then that success in attaining to the improved agriculture which all recognised as possible and as essential to continued agrarian prosperity, primarily depended on the sound teaching of agriculture to the boys and youths in the school, college, and university. The need of such sound teaching was perhaps greater and the opportunities finer, here than elsewhere in the world. Many problems in agriculture were peculiar to Australia, on account of the limitations of rainfall, seasonal variations, and climatic differences compared with other countries. With increase of population and facilities for transport of produce and the consequential rising of land values, there was urgent necessity for a corresponding increase of effectiveness of acreage, more intensive farming must be practised, and the effectiveness as regards output of every acre of land must be increased. From our hated enemy, Germany, as from our valiant allies France and Belgium, the lesson of closer settlement based on prudential and scientific methods should be taught by the State and learned by its agriculturists. Germany was managing to feed and maintain from its own resources a population of 68,000,000, with the agriculture of 123,000,000 acres of land—a little more than twice the area of Victoria with only 1,500,000 people. Belgium was able to put an army of 400,000 in the field within a week, while all Australia took a year to get a quarter of that number ready. In both instances the result achieved might properly be attributed to intensive farming on lines ever governed and ever modified by scientific teaching. To approach the same efficiency here the Education and Agricultural Departments must weld their efforts. It had all along been considered desirable to bring the officers of each Department into harmonious touch, but, unfortunately, it had been found impossible for our officers to spare the time to visit the 500 odd schools of the State in which agriculture is taught. So Mr. Greenwood, of your Department, and Mr. Richardson, our Agricultural Superintendent, decided that as Mahomet could not go to the mountain they would try and bring the mountain to Mahomet, and between them they have devised this Teachers' Farm School, to be held at Werribee, whereby for one whole week the education officers should contact each other, should contact the Agricultural Department's officers, and should have the opportunity of taking lectures on the different phases of agriculture under circumstances which would allow the principles expounded in the lectures to be immediately demonstrated in the practices, investigations, and researches that are being carried out on the farm. It was firmly hoped that, despite the necessarily crowded character of the daily programme, the fullest attention would be given by the class in order that the success of the scheme, which all desired, might be achieved. If successful, the scheme would probably be developed into the holding of many such classes throughout the year, but devoted to specialization on the various distinct phases of agriculture such as dairying, cereal culture, fruit-growing, sheep husbandry, irrigation farming, and the like. Finally, it was hoped that any discomforts



General View of Permanent Experimental Field, showing Rotation Plots.

which were entailed in the hurriedly made domestic arrangements, which were decidedly of a picnic character, would be met in a cheery spirit, and that the impressions carried away after the week's work would be pleasant and lastingly beneficial.

Mr. Wm. Cattanach, Chairman of the State Rivers and Water Supply Commission, gave an interesting review of the water resources of Victoria, and referred to the paramount necessity of increasing the water storages and developing irrigated agriculture on sound lines. At the present time, some 250,000 acres were irrigated in Victoria, and a policy of steady development was being carried out, with a view of ultimately bringing an extra 500,000 acres under irrigation. This objective, however, could not be fully achieved until our rivers were properly harnessed and adequate storages built. The policy of the Commission was to develop these storages and conserve as much water as possible.

Crop of Peas on Green Manurial and Feeding-off Tests Plot.

The Sugarloaf Reservoir was in course of construction, and, when completed, would impound 320,000 acre-feet of water. The storage at Waranga Basin was being increased to impound 330,000 acre-feet. Other storages were contemplated under the Murray Waters Agreement, and it was anticipated that when the present and prospective requirements were met some 750,000 acres of land would be placed under irrigated culture. That would enable Victorian agriculture to be placed on a firm foundation; and, with the proper development of such a large irrigated area, Victoria would be able to achieve her agricultural destiny, *i.e.*, the support of a dense rural population at a high standard of living.

As an instance of what irrigation could do, the example of Mildura was cited. On an area of 12,000 acres, an inland community of 6,000 souls, enjoying a high standard of comfort, was maintained. The annual value of Mildura's products was no less than £450,000.

Adjacent to Mildura was the infant settlement of Merbein, which gave promise of excelling its foster parent in production and in wealth.

In the valley of the Murray, it was possible to have a dozen Milduras, all supporting a dense, contented, and prosperous population.

Dr. T. Cherry, Professor of Agriculture at the University, referred to the value of agricultural science to the teacher. The future prosperity of Victoria depended on the farmers being educated in the schools of to-day, and it was to them, rather than to the present generation of farmers, that we have to look for the consummation of our high destiny as an agricultural community.

He had, he said, an interesting confession to make. Three years ago he had opposed the establishment of the Research Farm at Werribee, as he believed that a site at Dandenong, where three different geological formations met, would be more suitable; but, in view of the results

View of Lucerne Field, showing Method of Harvesting Lucerne Hay.

obtained at Werribee, he had to admit that his early judgment was wrong.

The farm was one of the best equipped in the world, and was doing work of a character equal to any elsewhere. He had reached that conclusion from the comments made by the members of the British Association for the Advancement of Science, who visited the farm last year, and from his personal observation and reading.

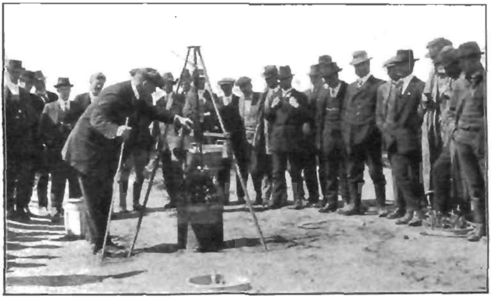
He looked upon the teachers of the High Schools and Primary Schools as an important factor in assisting the development of our agricultural resources, for they, more than any other section of the community, had the larger share in moulding the minds of the farmers of the future.

He was glad this school of agriculture was being held at Werribee, for the many-sided activities of the Research Farm—irrigated agriculture, dry farming, dairying, stock-breeding—would make a strong appeal to all those who are interested in agricultural advancement.

Extracts from a Student's Note-book.

The plan of instruction followed was to alternate lectures with practical demonstrations in the field, and to supplement this teaching with lantern slides. A short review of a student's note-book will disclose the scope of the instruction given. The first day's notes are divided into two headings—(1) How Crops Grow; (2) The Animals of the Farm.

Under the first heading, notes and rough sketches abound with information dealing with the life of the plant from germination to maturity, the method of growth being revealed by microscopic slides. The subject of soil fertility, and the problem of its maintenance, are set out in detail. The chemical, physical, and biological aspects of the problem are emphasized, and practical hints follow as the most approved methods of maintaining the productive power of the soil unimpaired.



Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Demonstrating Method of Determining the Water Requirements of Farm Crops.

The second lecture, "Manures and Manuring," deals with the composition of the soil and the plant, the variations in soil types, their deficiencies in plant foods, and how these latter may be partly overcome by resorting to the use of artificial fertilizers. The composition of the various fertilizers on the market, the methods of manufacture, the control exercised by the administration of the Artificial Fertilizers Acts in eliminating fraud, are given, together with the mode of valuation of manures. A review of the current practice of applying artificial manures in Victoria, and the modifications demanded by varying soil and climatic conditions in the various parts of the State, complete the section on "How Crops Grow."

Under the second heading on "The Animals of the Farm" is to be found copious notes on the anatomy of farm animals, and the essential differences in the conformation of the good, bad, and indifferent types. The concluding lecture of the first afternoon on "Cattle Breeds and Management" provides notes on the history and characteristics of the

various breeds, and the absolute necessity for careful management. Particular stress was placed on the attention to and study of individuality. A page of the note-book is devoted to Professor Osborne's illustrated evening lecture on "The Human Body as an Engine." The notes show that we have yet a long way to go before the steam-engine approaches perfection, as the energy obtained from a given amount of fuel is only 18 per cent. of the possible maximum. The most perfect

Mr. H. C. Wilson, Farm Manager, Demonstrating Method of using Grading Implements.

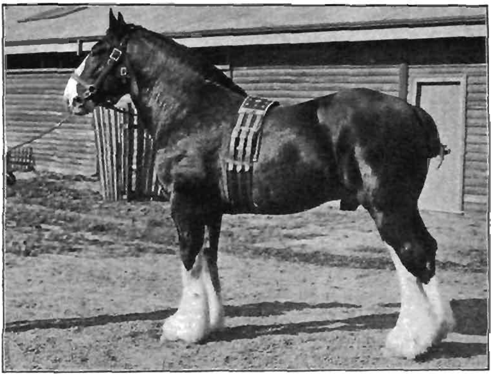
Group of Teachers attending Practical Demonstration on the use of Farm Implements.

of engines devised by human hands—the Diesel oil-engine—develops 45 to 50 per cent. Man, however, is able to generate over 50 per cent. for his feeding.

Turning to the work of the second day, we again find the notes divided under two headings (*a*) Dairying; (*b*) Fodder. Under dairying are complete and concise notes. All the points necessary for the maintenance and success of a modern dairy are enumerated. These include

the selection of the herd, the testing of the cows, the culling of the beasts giving unprofitable returns, the attention requisite for proper management, the planning and building of a serviceable yet economical milking-shed, with its conveniences and environments, information on milking machines, and, above all, the absolute necessity for cleanliness. Judging from the volume of the notes taken, methinks the student is located in some district south of the Divide.

Under fodder, the notes are most interesting; the lecture was entitled "Foods and Feeding." Such an immense subject could not be fairly dealt with in one lecture of an hour's duration. The note-book shows that it was divided into two parts, and, for sake of convenience and the purposes of this article, the two sets are combined and treated as one The science of economical feeding has been very much to the fore in



Clydesdale Stallion, "Major Oates."

recent years, and the careful manner in which the notes of this lecture were taken shows that the student is thoroughly acquainted with the fact. A list of the common foods—green, dry, and concentrated—their composition and value, are given. The theory of admixture to provide the balanced ration, the value of a chemical analysis in determining the various constituents, an explanation of the term nutritive ratio, the functions of the three main feeding units, and the method of calculating the unit value, are elaborated.

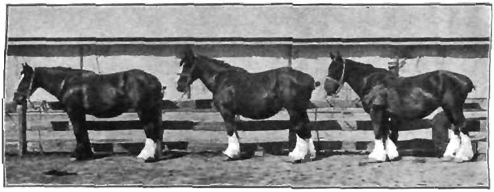
Pursuing the question of fodder still further, the notes from the third lecture give a description of the main grasses, both native and introduced. Methods of identification, suitability of soils and climate, interesting remarks on the habit of seeding, and various quaint peculiarities, render this lecture additionally valuable for nature-study and its object-lessons. The last, but by no means least, of the second day's proceedings deals with "Lucerne Culture." The student was fully alive to

the importance of this subject, for he heads his notes on this lecture, "The King of Fodder Plants—Alfalfa." The notes are voluminous, and practically tell all there is to be told of this valuable plant, including the type of soil most suitable for the growth of this legume, the preparation of soil, rate of seeding, varieties to sow, habit of growth, water requirements of the crop, the influence of irrigation, the essentials of success in lucerne culture, and the method of harvesting and curing hay.

The work of the third day is again divided into two headings, (*a*) Forage Crops; (*b*) Wheat and its Cultivation.

Under fodder crops are notes on the value of forage crops, both for fodder and the purposes of rotation. Information is given on the various forage crops grown in Victoria, varieties best suited for given districts, methods of treatment, yields per acre when grown under proper management, the composition and variation in feeding values.

Passing on, we come to notes on the subject of the second heading, namely, "Wheat and its Cultivation." Wheat is the raw material producing the staff of life, "our daily bread," and as turmoil and trouble exists in the greater part of the wheat world to-day, with a



Group of Clydesdale Mares.

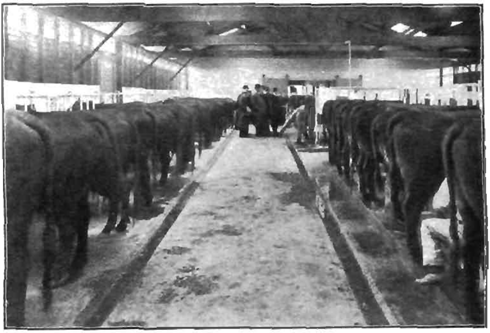
consequent decline in production, this subject claimed more than usual attention. The notes are, in quantity and quality, sufficient to flatter the lecturer, as the student has not let the grass grow under his feet in availing himself of every opportunity for making notes on the information imparted.

The present position of the wheat industry in Australia, its possible future development, and the manner in which that development is to be brought about, were the main headings of this lecture. The notes indicate that future progress lies along two well-defined tracks, namely, increasing the acreage under cultivation through the winning of new lands to wheat-growing, and the raising of the average yield per acre. The latter is to be brought about by further improvements in agricultural machinery, the more extended use of fallowing, better working of the fallows, the adoption of systematic crop rotation, rational use of fertilizers, and careful seed selection.

In addition to the preceding notes are some on "Germ Life in the Dairy"; and in the main teach the lesson of cleanliness and sterilization as being the absolute essential of success.

The note-book on the fourth day is headed (*a*) Farm Animals and their Diseases; (*b*) Tree Planting; (*c*) Plant Breeding. The notes from the first lecture deal with "Sheep," and enumerate the various breeds, their characteristics, management, and usefulness. Mention is also made of cross-breeding for wool, mutton, and early lambs. The notes from the second lecture on this day have an amusing headline, "A Horse, a Horse, my Kingdom for a Horse!" from which it is inferred the student is not an ardent motorist. The essential points of the horse, the various breeds, breeding, and management are set down in due order.

Notes on "Tree Planting" next appear. Shelter and shade propagation, suitability for special purposes and places, are dealt with. The best trees to plant are those that nature provides for the locality. From the lecture on "Plant Breeding," we find profuse and detailed notes on the origin of new species, the nature of variation, and the effects of



Milking Time—View of Interior of Cowshed, showing Red Polled Cattle.

acclimatisation, selection, and hybridization on plants. The methods employed by the wheat-breeder in improving old varieties and creating new types is set out in detail, and the laws governing the inheritance of typical unit characters are indicated and illustrated by actual results obtained in the wheat-breeding investigations at the farm. No longer is the path of the wheat-breeder clouded with uncertainty and doubt. Equipped with full knowledge of the laws of inheritance acquired during the past decade, he may now go forward in his work of evolving new prolific types with a degree of certainty never hitherto enjoyed.

The evening illustrated lectures provide additional profuse notes on "The Contagious Diseases of Stock," and "Diseases Communicated by Milk."

The notes on the fifth and concluding session are subdivided into (*a*) Fungus Diseases; (*b*) Irrigation Methods; (*c*) Herd Testing. The notes

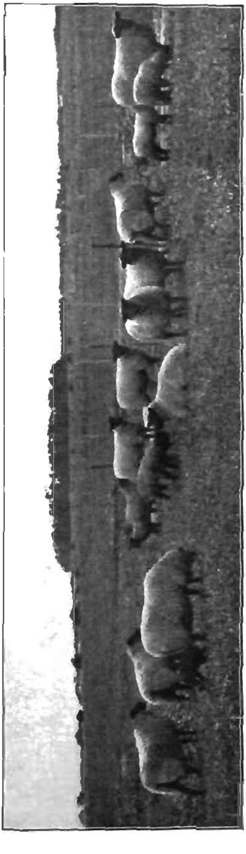
on the first lecture summarize the principal diseases that exact heavy toll from our cultivated crops, their cause, mode of dissemination and control. Such prevalent diseases as smut, rust, takeall, are dealt with in detail. The second lecture provides notes on irrigation methods, and sketches the extent of irrigation in other countries and the principal features of the irrigation systems of the old world. A survey of the water storages and irrigation areas of Australia, and explanations of the system of grading,

Another View of Cowshed Interior at Milking Time, showing Red Polled Cattle.

levelling, checking land are given, as well as the methods of applying water to varying types of the soil, and to various crops. The merits and limitations of the different systems of irrigation in vogue in Victoria are set out.

From the third lecture, "Herd Testing," we obtain notes giving information on the testing of dairy herds with a view of eliminating the "robber" cows, and raising the general standard of the herd. The scope, objectives, and methods adopted in the Government scheme of herd testing are discussed in detail.

Thus we come to the end of the student's lecture notes; but, on handing the book back, with congratulations to its owner, another book is produced. It is headed, "Demonstration Field Notes," and is almost



Group of Stud Suffolk Ewes and Lambs.

as great in volume as the preceding one. It is packed with information on actual farm practice. We find a rough sketch of the farm dairy, with remarks on the various cows, their milk yields, a brief description of the dairy laboratory and its fittings, and practical hints on the preparation and mixing of foods and feeding of cattle. A sketch illustrates the silos, mention being made of the value of ensilage and the factors which rule in successful silage-making, together with other practical points too numerous to mention. Then there are detailed notes of the manner of handling and examining a draught horse for soundness, and the factors which influence a good judge in determining the value and quality of a horse. A page is filled with short notes on age and dentition of sheep, calendar of operations on a sheep station, the distinguishing features of the various wool and mutton breeds, a descriptive account, accompanied by rough drawings of the various farm implements used in grading and preparation of the land for irrigation, the manner of putting up levee banks and applying irrigation water to lucerne and other forage crops.

A rough plan of the farm, with its subdividing roads and lanes, setting out the numerous fields, and including the permanent rotation, manurial, lucerne, and pasture trials, occupies a full page of the notebook. A note is also made

of the "Pot Enclosure," with its special experiment on the combined influence of lime and green manuring in rendering available the phosphoric acid of both natural and artificial phosphates. Mention is also made of the daily routine methods of measuring the temperature of the soil; calculating the hours of sunlight per diem, and estimating the amount of water which is daily evaporated from a known surface.

There is not one corner of the 1,000 acres which is not remarked upon, nor one experiment of the many hundred being conducted that has missed the eye of this painstaking student; and it follows indubitably *that the information absorbed into this one brain will, in a space of* a few years, be imparted to many young people—budding farmers, and wives of the farmers of the future.

The school teacher remarks during conversation of his former belief that the farmer and his family must, by the nature of his occupation, be deprived of reasonable leisure and luxury; that comfort did not enter into his life, which was reduced to the mere act of living, but his views had changed. His new opinion was that where such a life exists, it is the farmer's fault; the direct outcome of bad system and management, the result of careless and obsolete methods.

The condition of the State Research Farm, with its magnificent crops on the recognised poor and exhausted soil, had taught this school teacher the lesson of successful farm practice, and had so impressed him that he is already contemplating and planning the day when he forsakes the drudgery and unthankfulness of the Civil Service for a life of ease and comfort within the bounds of his own small farm, there to enjoy the pleasure of husbandry, and to find that the soil will not rebel against authority, but will give back with usury what it receives.

And so it should be assumed that the "Teachers' Farm School" of 1915, so successfully installed, and so splendidly brought to a conclusion, has served a twofold purpose, firstly, in disseminating, per medium of the schoolmaster, the latest in modern agriculture; and secondly, impressing the said schoolmaster with the knowledge that nothing can be more profitable, nothing more beautiful, than a well-cultivated farm.

Taking into consideration the status and popularity of the local schoolmaster, and his influence amongst the rising generation, does not this impression vie in importance with the value of the knowledge gleaned? I think so.

Visit to Werribee Irrigation Settlement and Werribee Park Estate.

Friday afternoon was given up to a lecture and demonstration on herd testing, and a visit to the Werribee Settlement.

The State Rivers and Water Supply Commission very kindly provided two large motor charabancs, and at 3 p.m. the party proceeded to inspect the young irrigation settlement.

The Werribee Estate, formerly a huge sheep run, was now to be seen cut up into small farms averaging from 40 to 50 acres, each commanded by water channels. The numerous settlers' homes, approximately a dozen families to each square mile of country, afforded a pleasing contrast to the old order of things, when far less than one family was supported on each square mile. Mr. Horsfield, of the Engineering Staff of the Water Commission, conducted the party round the settlement,

and gave informative discourses on the various phases of irrigation practice. During the course of the afternoon, a visit was paid to the Werribee Park Estate, where Mr. Chirnside personally conducted the visitors over the property. The exceptionally fine herd of Jersey cattle was inspected just prior to milking, and looked remarkably well.

The draught stock, and particularly the draught stallion Baron Bute, were much admired. A field of 30 acres with fairly steep contours was being prepared for irrigated lucerne, and this afforded an interesting opportunity for a short, practical demonstration on irrigation methods.

The Break-up.

Before breaking up, Mr. A. Eddy, Headmaster, Beeac State school, on behalf of the teachers, proposed a vote of thanks to Dr. Cameron and staff for the attention and many courtesies shown them during the week. He, and his fellow teachers, he stated, had spent on the Werribee Farm a most interesting, instructive, and enjoyable week. The visit had been a perfect eye-opener to them all. He wished to emphasize that this vote of thanks was not a mere formality, but a sincere expression of the feelings of them all. He could express nothing but admiration for the scientific manner in which all the various experiments in crop rotation, fertilization, wheat-breeding, irrigation, &c., were carried out; and they were certain that the results of the work inaugurated at Werribee would ultimately be of the very greatest value to the agricultural interests of the State.

They could not, of course, hope to carry out their experiments in the school plots on anything like the same scale, or with the thoroughness that was characteristic of the State Research Farm; but still they had, in the all-too-short week available to them, obtained such an insight into the scope and objective of agricultural research work as would enable them to go back to their schools with a fuller knowledge, and a far livelier appreciation, of the many problems involved in increasing Victoria's average annual out-turn in agricultural products.

Mr. A. E. V. Richardson, Agricultural Superintendent, in responding to the vote of thanks on behalf of the officers of the Department, said it was pleasing to know that, in the judgment of the teachers, the week's work had been a distinct success. It was, of course, very difficult to deal with any of the many subjects in anything but a cursory manner in the brief time available; consequently, the week had been spent entirely in dealing with the broad generalizations and principles underlying each subject.

It was intended, at a later date, to have special courses for the study of special subjects, *e.g.*, Wheat Cultivation, Dairying, Irrigation Farming, Fruit Culture, when more time could be given to the study of details.

The present course was intended to give a birdseye view, so to speak, of the agricultural problems confronting us in Victoria, and to stimulate an interest in the experimental investigation of these problems. Not the least valuable part of the week's work would be clearer knowledge gained by the full and free discussion of these problems among themselves. As far as the Department of Agriculture was concerned, the undertaking that week had been in the nature of an experiment, as it was the first time that such classes had been held in Victoria; but the keenness with which all the work had been followed, and the evident

appreciation exhibited that afternoon, would be a justification for organizing a more extended series of such classes in the near future.

LIST OF SUBJECTS AND DEMONSTRATORS.

A.—*Agriculture*—

1. Principles of Manuring.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
2. Wheat and its Cultivation.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
3. Plant Breeding.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
4. Irrigation Methods.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
5. Lucerne Culture.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
6. Experiment and Research Work.—A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.
7. Soil Fertility and its Maintenance.—T. A. J. Smith, Chief Field Officer.
8. *Forage Crops.—T. A. J. Smith, Chief Field Officer.*
9. Farm Implements.—H. C. Wilson, Manager, State Research Farm, Werribee.
10. *Irrigation (Demonstration).—H. C. Wilson, Manager, State Research* Farm, Werribee.
11. Grasses—Native and Introduced.—G. H. Adcock, F.L.S., Principal, Viti*cultural Station, Rutherglen.*
12. Tree Planting.—E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.
13. Fungus *Diseases of Farm Crops.—C. C.* Brittlebank, Vegetable Pathologist.
14. The use of the Microscope (Demonstration).—C. C. Brittlebank *Vegetable Pathologist.*
15. Management of Pastures.—G. S. Gordon, Field Officer, Werribee.

B.—*Animal Husbandry*—

1. Principles of Breeding.—S. S. Cameron, M.R.C.V.S., D.V.Sc., Director of Agriculture.
2. Horse—Breeds and Management.—S. S. Cameron, M.R.C.V.S., D.V.Sc. Director of Agriculture.
3. Cattle—Breeds and Management.—S. S. Cameron, M.R.C.V.S., D.V.Sc. Director of Agriculture.
4. Outlines of Anatomy and Physiology of Animals.—W. A. N. Robertson B.V.Sc., Chief Veterinary Officer.
5. Diseases Communicable by Milk.—W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.
6. Contagious Diseases of Stock.—W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.
7. Cattle—Breeds and Management.—W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.
8. Sheep—Breeds *and Management.—H. C. Wilson, Manager, State* Research Farm, Werribee.
9. Dairying.—R. T. Archer, Senior Dairy Inspector.
10. *Herd Testing.—R. T. Archer, Senior Dairy Inspector.*
11. Foods and Feeding (2).—B. A. Barr, Dairy Supervisor.
12. Germ Life in the Dairy.—B. A. Barr, Dairy Supervisor.
13. Foods and Feeding (Demonstration).—*R. R. Kerr, Dairy Supervisor.*

C.—*General*—

The Human Body *as an Engine (Illustrated Lecture).—W. A. Osborne* D.Sc., Professor of Physiology, Melbourne University.

The following letter has been received by Dr. S. S. Cameron, Director of Agriculture:—

Education Office, Melbourne,
12th October, 1915.

School of Agriculture.

SIR,

I have the honour, by direction, to forward the accompanying report from Mr. J. P. McLennan, Warragul High School, in regard to the School of Agriculture, held recently at State Research Farm, Werribee.

I am at the same time to express satisfaction at the success of the school, and to thank you and your officers for providing such a profitable course of instruction.

This Department will be glad to co-operate in further schools of instruction in wheat and fruit growing areas of the State.

I have the honour to be, Sir,
Your obedient servant,
(Sgd.) A. FUSSELL,
pro Director.

School of Agriculture held at State Research Farm, Werribee, from 20th September to 24th September, 1915.

REPORT TO DIRECTOR OF EDUCATION.

By Mr. J. P. McLennan, Head Master, Agricultural High School, Warragul.

Domestic Arrangements.—The arrangements made by Mr. R. H. Greenwood, Inspector of Agriculture, in conjunction with the officers of the Department of Agriculture, were excellent; and general regret was felt at the unfortunate absence of Mr. Greenwood on account of illness.

The convenience and comfort of the students were provided for in every possible way, *e.g.*, special provision of lecture room, comfortable sleeping accommodation, shower baths, and sanitary accommodation. The catering, which was in the hands of Mr. Cumberland, was first-class.

Interest shown by Officers of Agricultural Department.—The greatest possible interest was taken in the work by the officers of the Department of Agriculture. The presence of Dr. S. S. Cameron, Director of Agriculture, during the week, and the active co-operation he took in the work were much appreciated by the teachers. Mr. A. E. V. Richardson, Superintendent of Agriculture, was untiring and unsparing in his efforts to make the week a successful one, and to this gentleman is largely due the undoubted success of the undertaking. These gentlemen were ably supported by Mr. Temple Smith, Chief Field Officer, Mr. H. C. Wilson, Farm Manager, and the other officers who contributed to the week's instruction.

The provision of microscopes and slides by Mr. Brittlebank, and text-books by Mr. Richardson, was much appreciated.

Syllabus of Work.—The matter contained in the lectures, which in all cases was supplemented by demonstrations in the field, was appreciated, and should benefit the teachers who had the privilege of

attending. The mere fact of spending a week on the State Research Farm under the guidance of experts was a liberal education in itself. The importance of field experiments, and the necessity of methodical arrangements and careful and accurate making and recording of observations, were clearly and emphatically demonstrated. The results of investigations being carried out on this farm will be of immense benefit to Victoria and Australia; many of them will prove of world-wide interest.

The experience gained at this, the first school for teachers undertaken by the Department of Agriculture, will be of value when preparing the syllabus of work on future occasions. I feel sure that the officers concerned will see the advisability of making modifications in some directions. It seemed to me that rather much was attempted to be done in such a short time. In some topics, *e.g.*, milk and its products, and composition of foods, the majority of the students had not the requisite knowledge of chemistry to fully appreciate the lectures, which, however, were well delivered, and at only a few hours' notice, by an officer who took the place of the one originally allotted to the task. Although very little chemistry is taught to children learning agriculture in elementary schools, I would urge the necessity of teachers gaining a sufficient knowledge of that science to enable them to understand clearly the composition of milk and its products, foods and feeding, and the principles of manuring.

Future Schools.—The proposal of the Director of Agriculture and the Education Department to hold schools of instruction in special branches of agriculture is a good one. Wheat and irrigation farming might be combined in a school at such a locality as Shepparton, while dairy farming and the raising of fodder crops could be dealt with at schools in the Western District and Gippsland.

With the experience gained at Werribee, the proposed schools would prove valuable to the teachers in the districts concerned.

General.—The lectures and other entertainments given during the evenings were much appreciated. On Tuesday evening the possibilities of the home cinematograph as an aid to education were fully demonstrated. The visits paid to the school by the Honorable Mr. Hagelthorn, M.L.C., Dr. T. Cherry, the Professor of Agriculture in the Melbourne University, Mr Wm. Cattanach, the Chairman of the State Rivers and Water Commission, and the Chief Officers and Inspectors of the Education Department showed the interest taken by those gentlemen in Agricultural Education, and were appreciated.

The importance of a closer co-operation between the various bodies concerned with agricultural education was emphasized by all who addressed the meetings.

The school was an undoubted success, and the experience gained by the teachers will stimulate them in this important branch of education.

(Sgd.) J. P. McLellan,
Agricultural High School, Warragul.

MILLING AND BAKING TESTS ON ARGENTINE AND WALLA WHEATS.

By P. R. Scott, Chemist for Agriculture, and F. G. B. Winslow, Departmental Miller.

Introduction.

The trying times experienced by the wheat-growers of this State culminated in a prolonged drought, with a shortage of available wheat for local requirements. It was found necessary, in order to meet local demands, to import shipments of wheat from overseas, and amongst the shipments so imported were cargoes brought in of Argentine wheat by the steamer *Baron Minto* and of Walla wheat by the *Strathendrick*.

Both of these wheats have a world-wide reputation for quality, and have been largely used in European and other countries for some years past, with more or less satisfactory results. The wet and stormy weather experienced during the ripening and harvesting operations of the Argentine wheat affected the quality and the general appearance of the bulk wheat. Consequently this wheat suffered by comparison with our own home-grown wheat.

Wheat grown in the Argentine Republic is generally known as "Plate." Of late years this has become a strong competitor in the world's wheat market. Up to the beginning of the last harvest, the surplus wheat for export from the Republic was estimated at approximately 144,000,000 bushels; unfortunately, weather conditions disastrous to the crop, intervened, and considerably reduced this surplus. Last season's crop, as far as quality is concerned, suffered in consequence, and the bulk samples contained, among other impurities, a fair percentage of sprouted grain.

The harvesting of the crop is generally finished towards the end of December; the new season's wheat can, therefore, be placed on the market about midway between the supplies from North America and Southern Asia. It may also interest the local grower to know that Australian wheat usually commands a higher price on the European market, and, although subject to fluctuation, our Australian-grown product holds its position, and usually fetches about 3s. per quarter more than the Plate, Walla coming about midway between these two (a quarter = 480 lbs. = 8 bushels).

Oregon or Walla Walla is wheat grown on the Pacific coast in the United States. This wheat was of a composite character, containing some varieties of good colour, size of berry, and general appearance; others were of poor colour, shotty or thin in berry. This wheat required similar treatment to the Argentine to obtain best results. Among the popular varieties of this wheat grown may be noted Little Club, a very popular variety at present; Galgalos, Propo; White Australian is rapidly becoming a favorite. Some of the varieties are somewhat similar in appearance and colour to the ordinary type of Australian wheat.

The sale of the Argentine wheat has caused considerable trouble owing to frequent disputes over the weight, &c., the reputation of the

wheat, in consequence, suffering. To rectify this, amended terms of contract for the sale and purchase of the Plate wheat has been agreed to, the principal features of the new order being:—The wheat to be bought on the basis of the natural weight as ascertained by the 20-litre scale, and that the following rate of allowances be given:—1¼ per cent. per lb. per bushel for the first 2-lbs. deficiency; 2 per cent. per lb. per bushel for the third and fourth; over that the allowances to be subject to arbitration.

As most of the varieties of wheat grown are not familiar to Australia, some of the more important varieties are the Rosafe, Barruso, and Barletta. The latter variety is one of the most extensively grown. Originally introduced from Italy, it has become popular owing largely to its inherent quality of standing well in the ear without shelling out after ripening, and its adaptability to local conditions. The grain is a medium-sized, dark-coloured, smooth grain, resembling somewhat Red Fife in appearance. Impurities were found in varying quantities in the Argentine wheat, and, consequently, there is a considerable loss in the cleaning and sifting processes prior to the milling. This loss is made up of screenings, chaff, oats, barley, dirt, and drake.

The bulk wheat of this State, in common with the other Australian States, has long been recognised as the easiest wheat to mill grown in the world, conditioning, breaking down, and dressing without any trouble. It is not surprising, therefore, to find that most of the Victorian mills are designed to deal with Australian-grown wheat. These plants are known throughout the trade as short-system ones, and do their work in a satisfactory manner. To obtain good returns from the Argentine and Walla wheat, a long-system plant is required, as these wheats are difficult to break down, and do not dress freely, requiring more roll surface and dressing machines to do good work. Even when using a long-system plant, the wheat should be of good quality for the mill to carry a full load. If the grain is damaged or sprouted, the flow sheet should be cut down considerably, or the mill will have a number of chokes that will give unsatisfactory returns.

Using the short-system plant in grinding these wheats, the miller, to produce a flour up to the Victorian standard, should cut down his flow sheet from 5 to 10 per cent. (the amount depending on the plant) to have sufficient roll and dressing surface; if the grain is damaged or spoiled it will be necessary to take a higher percentage of the feed. Some millers, to get the average output of their plant, have altered their silks on the flour dressing machines by putting on coarser silks. Where this is done, the purifiers are overloaded, and the purification of the semolina and middlings is unsatisfactory. The middlings and semolina are therefore sent to the rolls, containing impurities, and the colour of the flour is damaged on account of these impurities being allowed to go to the flour bag. Flour of a good colour is much desired, and is one of the main points by which its relative value is judged to a large extent by the miller and baker. As the colour depends largely upon the mechanical composition of the flour, the poorer the milling process, the larger the adulteration with foreign particles, and the darker the colour of the flour. Using the most improved method of milling these wheats, it is questionable whether a flour could be produced of as good a colour as that obtained from Australian wheat.

The cargoes of the wheats imported were, with the exception of one small shipment, of fair milling quality.

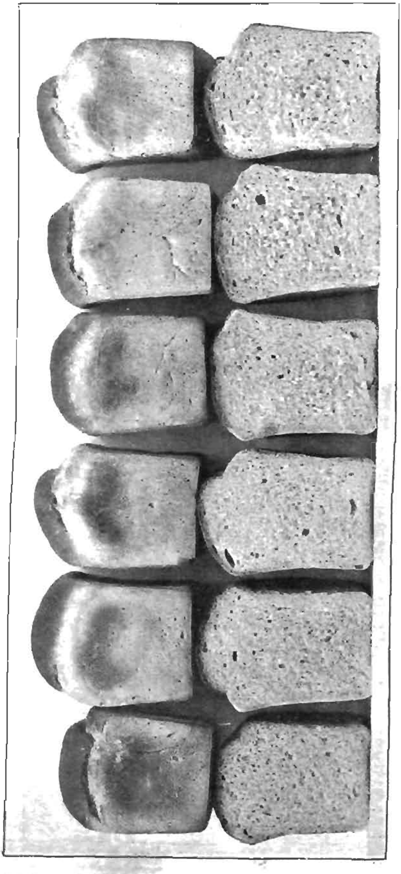
The flour produced was of good baking quality, fair colour, but lacking the rich bloom of Australian flour. Compared with Australian wheat, the bushel weight was slightly lower in both the uncleaned and the cleaned samples, the percentage of flour slightly higher, the gluten content was higher in the Argentine, and bran not so broad. The percentage of moisture in wheat is not without some practical importance, and should never exceed 13 per cent. in a good sample. It is, therefore, satisfactory to note that of all the shipments tested, the only one exceeding that percentage was the small shipment already referred to. A moisture content of 14.8 per cent. was found in this wheat, and probably accounted for the wheat grains being badly discoloured and sprouted; this wheat was, in consequence, of inferior quality, and would cause trouble to the miller.

Baking Quality.

The baking test furnishes the most reliable guide for judging the value of a flour, the baked bread is the one way by which one is able to judge a flour, taking into consideration its capacity to produce well-piled loaves of even texture in large quantity. Bakers desire a flour to which they can add a maximum amount of water, and still have a loaf that will rise well and present an even texture and good colour.

Average of Milling Tests of Wheats from Argentine, Oregon, and Victoria.

	Argentine.	Walla Walla.	Australian, F.A.Q., 1914–15.
Bushel weight, original sample ..	61 lbs.	61·4 lbs.	—
,, ,, cleaned ,, .	63·2 lbs.	63·5 lbs.	62 lbs.
Moisture used in conditioning ..	3·0%	3·0%	3·0%
Break flour	7·9%	8·8%	8·2%
Flour	70·5%	69·7%	70·0%
Bran	17·2%	16·6%	18·0%
Pollard	12·4%	13·7%	12·0%
Moisture	11·47%	11·47%	11·43%
Protein in wheat	11·50%	9·30%	13·06%
Flour Tests.			
Protein	10·87%	8·37%	11·87%
Wet gluten	30·73%	24·96%	25·89%
Dry ,, ...	10·62%	8·33%	8·63%
Colour—max. 20 .. .	18	18	20
Quarts water to 200-lbs. flour ..	46·3 qts.	43·8 qts.	46·4 qts.
Baking Tests.			
Water used for doughing ..	196 ccs.	186 ccs.	195 ccs.
Weight of loaf	471 grms.	466 grms.	476.5 grms.
Volume of loaf	1,428 ccs.	1,435 ccs.	1,605 ccs.
Texture—points, 20 max. ..	17	18	18
Colour— ,, ,, ,, ...	17	17	18
Comparative Analysis.			
Bushel weight	98·3 points	99·0 points	100 points
Protein in wheat	88·0 ,,	71·2 ,,	100 ,,
Flour	100·7 ,,	99·5 ,,	100 ,,
Water absorption capacity ..	99·7 ,,	94·4 ,,	100 ,,
Volume of loaf	88·9 ,,	89·4 ,,	100 ,,
Total	475·6 points	453·5 points	500 points



Loaves Baked from Imported and Australian Wheats.

Walla Wheat. — Australian F.A.Q. — Australian F.A.Q. — Argentine Wheat. — Walla, 45. Argentine, 45. F.A.Q., 10. — Walla, 40. Argentine, 40. F.A.Q., 20.

In baking Argentine and Walla flour it was found necessary to give a longer proof than the Australian flour required. If the dough is taken too green, the bread has a coarse flavour, and the crust a foxy appearance. If given sufficient proof the bread has a good flavour, the crust still a slight foxy appearance. Walla flour requires to be made into a tight dough; when proving, the dough becomes soft and weak; the gluten is evidently of a poor quality. Blended with Australian or Argentine flour, the dough was strong and firm. When a small percentage of Australian flour alone was used, the loaf baked was of good quality; the colour, texture, volume, crumb, and general appearance satisfactory. Argentine wheat, when sound, is of good milling quality, producing a flour of medium strength, the gluten content being high, and the bread of a fair nutritious value. It is a good wheat for blending with other wheat. The chief drawback to the miller is the amount of foreign matter contained.

The Argentine wheat, composed of small, red grain, fairly soft, gave a broad bran and flour of fair colour.

Walla Walla was composed principally of small, plump white grain, and a small percentage red grain; flour, soft and of fair colour. Australian f.a.q. was composed of large plump grain of good appearance, bran broad, and flour with good bloom.

The average composition, and the milling and baking qualities of these imported wheats, when compared with this season's f.a.q. sample, suffer by comparison. Neither of these wheats produced a flour equal in baking power to that obtained from the local wheat. While slight variation may be noted in the composition of the wheats, these differences may be partly accounted for by a variety of circumstances, such as difference of varieties grown, climatic conditions, and soils. The difference in the size of the grain was especially noted. Both these wheats were composed of smaller grains than the home-grown sample. The Argentine flour was highest in gluten content, and slightly higher in its water absorption power, while Walla flour contained a slightly smaller percentage of gluten and lower water absorption power than the local flour. The baking test of these flours produced a loaf of smaller volume, inferior in texture and colour, to that produced from the f.a.q. flour. Although inferior in quality in producing a well-piled loaf of an even texture, when compared with the f.a.q. flour the loaves baked from the flour milled from these wheats were of fair marketable quality, and would make a good substitute in times of emergency.

In order to test the capability of the flour for blending with Australian flour, a number of baking tests were made. The tests consisted of mixing varying proportions of Argentine and Walla flour and Australian in minor quantity. The loaves baked from two of the tests gave the following results:—

No. 1 Test—Argentine, 45;	Walla, 45;	Australian, 10.
No. 2 " " 40;	" 40;	" 20.

	No. 1.	No. 2.
Water used in doughing ..	190 ccs.	190 ccs.
Weight of loaf	470 grams.	472 grams.
Volume of loaf	1,580 ccs.	1,590 ccs.
Texture points, 20 max. ..	18	20
Colour— " " " ..	19	20

SUMMARY.

The Argentine and Walla wheat berries were smaller in size and darker in colour than the Australian wheat.

A comparatively high percentage of impurities was found in the bulk samples. A longer time and more attention were required to bring the wheat to an even temper for the breaks.

Much more difficult to mill than the local grown wheats owing to the proportion of hard wheats in the sample.

The flour produced was lacking in bloom when compared with the local flour. The dough required a longer time to prove, and lacked the power to produce as good all-round loaves as the local flour.

Good loaves were baked when blended with a moderate percentage of local flour.

(*To be continued.*)

WHAT MAKES MILK AND BUTTER YELLOW?

Recent experiments carried on by the United States Department of Agriculture have demonstrated that the rich yellow colour demanded by the public in dairy products is due to the character of the cow's feed.

The experiments were carried on in co-operation with the Missouri State Experiment Station. This question has been studied for many years by dairy experts. Their conclusion is that, although to some extent a breed characteristic, the intensity of the yellow colour may, within certain limits, be increased or diminished at will by changing the animal's rations.

Chemical tests show that the yellow pigment in milk consists of several well known pigments found in green plants. Of these the principal one is carotin, so called because it constitutes a large part of the colouring matter of carrots.

The other yellow pigments in the milk are known as xanthopyles. These are found in a number of plants including grass, but are especially abundant in yellow autumn leaves. These pigments pass directly from the feed into the milk. This explains the well-known fact that fresh green grass and carrots increase the yellowness of butter, the only standard by which the average person judges its richness.

On the other hand, a larger proportion of these pigments is deposited in the body fat and elsewhere in the cow. When the ration is changed to one containing fewer colouring constituents, this hoarded store is gradually drawn upon, and in consequence the yellowness of the milk does not decrease so rapidly as it otherwise would. This yellowness increases, however, the instant the necessary plant pigments are restored to the ration. Green grass is probably richer in carotin than any other dairy feed. Cows fed on it will, therefore, produce the highest coloured butter.

Green corn, in which xanthophyll constitutes the chief pigment, will also produce a highly-coloured product. On the other hand, a ration of bleached clover hay and yellow corn is practically devoid of yellow pigments, and the resultant milk from the cows fed upon it will gradually lose it colour. It is, of course, indisputably true that the breed does influence the colour of the milk fat, but vary the ration and there will be a corresponding variation in the colour of the milk fat in each breed.—[Extract from *Pure Products*, March, 1915.]

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

(*Continued from page 486.*)

The Slender Mallee (*Eucalyptus calicogona. Syn. E. gracilis*).

(Fig. 35.)

A shrubby eucalypt forming together with the Giant Mallee (*E. incrassata*). The Hooked Mallee (*E. uncinata*), and the Oil Mallee (*E. oleosa*), the extensive Mallee Scrubs. Several stems usually spring from the one root, flowering occasionally at a height of 6 feet, but in the course of years rising to 25 feet. Bark silvery-grey or whitish. Leaves scattered, narrow lance-shaped or oblong linear, not very long, nor very uneven-sided, slightly curved, of equal colour and shining on both sides, veins hardly visible, not very spreading. Clusters of flowers singly at shoulders of leaves or some few endways, on thin stalks, with usually four to eight comparatively small flowers; buds lined lengthways with three to five angles; lid half-round or pyramid-shaped; fruits small, reversed conical, or somewhat urn-shaped, sometimes half egg-shaped, usually faintly angular, three or oftener four celled.

The Mallee Eucalypts vary considerably in the size and shape of leaves, buds, flowers, and fruits, the different species merging into one another so far as appearance goes, and it is therefore often difficult to identify variations. When more information is available as to the normal time and frequency of flowering and the length of time in bud of the various species, the apiarist will have an additional means of identification when in search of bee pasture.

Nothing distinctive in regard to the nectar and pollen production of the Slender Mallee is known at present.

The Oil Mallee (*Eucalyptus oleosa*).

(Fig. 36.)

As the name indicates, this is one of the shrubs from which eucalyptus oil is distilled, but notwithstanding there are several eucalypts yielding a larger amount (a table showing the amounts obtained from the different Victorian eucalypts will be published further on). The species under review form a large proportion of the Mallee Scrub (more or less intermixed with other vegetation), constituting tall bushes branched from the root on wide, particularly sandy tracts of arid inland depressions. In the ordinary bushy state it seldom exceeds 15 feet in height. The leaves are narrow or oblong, lance-shaped, pointed, slightly curved, of equal colour on both sides, often pale or grey-green, sometimes very shining and sometimes almost opaque; veins spreading very close together, very faint and often quite concealed; the oil glands are dark, very minute, and can only in young foliage be seen clear through the leaf. The clusters of flowers occur singly at shoulders of leaves or sideways on the branchlets on a slightly compressed stalk, bearing from

four to eleven pedicellate flowers; the buds are usually long pointed, but sometimes shorter and blunter, resembling those of the Hooked Mallee (*E. uncinata*), the leaves of the latter are, however, generally narrower. The fruits of the Oil Mallee are small, cylindrical egg-shaped, with the valve flaps narrow pointed, erect, and often remaining connected at the

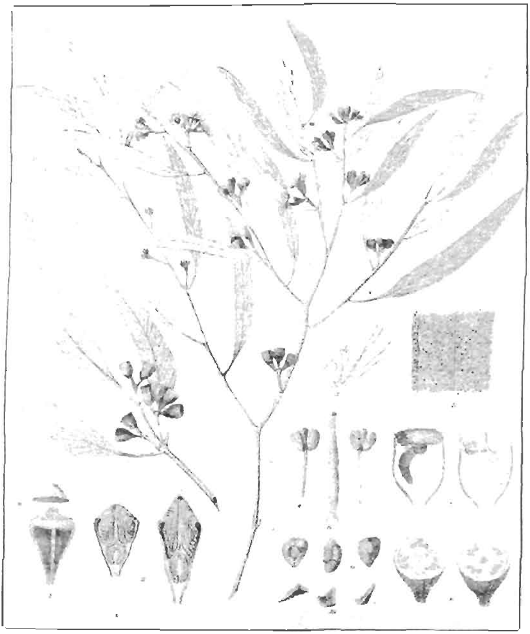


Fig. 35.—The Slender Mallee (*Eucalyptus caligcogona* F.v.M. *syn. Euc. gracilis*).

points. Reference to the illustration, Fig. 36, shows that the fruits readily distinguish this species from others resembling it in leaf and other features.

The bark on aged plants gets corky but comes off in patches, while in younger plants it is smooth and pale. The porous horizontal roots,

like those of some other Mallee Eucalypts, when broken, give a supply of almost pure water, hence it is also known locally as Water Mallee.

As a nectar and pollen-producer, this species has not, so far, been isolated from others in the company of which it grows.

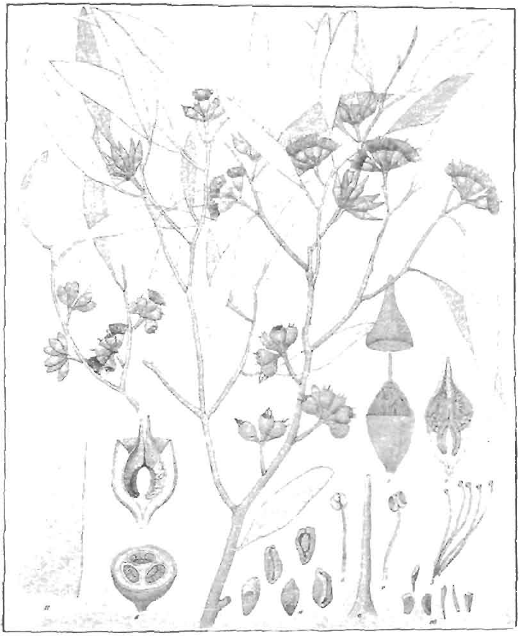


Fig. 36.—The Oil Mallee (*Eucalyptus oleosa* F.v.M.).

THE GIANT MALLEE (*Eucalyptus incrassata*).

(Fig. 37c.)

A shrub usually of tall growth, with several stems from the same root, exceptionally rising to a tree up to 30 feet, but flowering already at a height of 4 feet. Bark smooth, outside of a whitish or reddish colour, persistent or shedding its outer layers; branchlets rather thick and rigid, not drooping. The leaves are almost evensided, ending in a

narrow-pointed curved end; ovate or narrow lance-shaped, thick, of equal and light colour, as well as shining on both sides; veins close and spreading at rather an acute angle, the marginal vein distant from the edge of the leaf. Umbels of from three to eight flowers at the shoulders

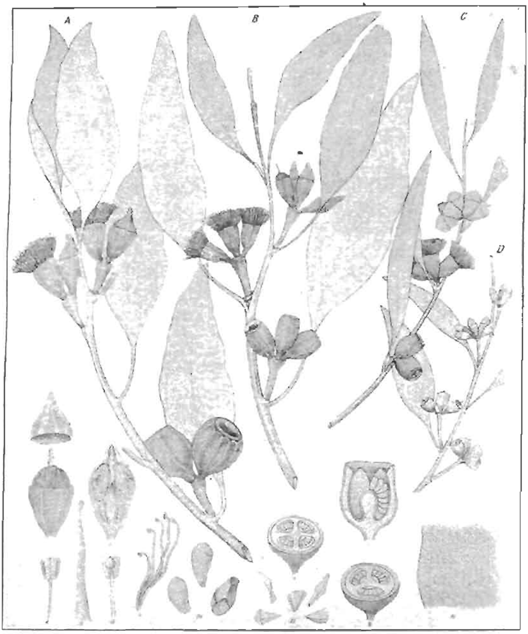


Fig. 37.—The Giant Mallee (*Eucalyptus incrassata* F.v.M.).

A. *Euc. incrassata*, var. angulosa.
B. *Euc. incrassata*, intermediate form.
C. *Euc. incrassata*, normal form.
D. *Euc. incrassata*, var. dumosa.

of leaves or sideways on the branchlets. The buds are shining, generally streaked lengthways, half-egg or somewhat bell-shaped, fruits half-egg or cylinder egg-shaped, more or less furrowed and streaked, three to four, rarely five celled. In regard to this species, it is difficult to give a

clear definition of the buds and fruits, as there are intermediate forms (Fig. 37B) between the species and its varieties (Figs. 37A and 37D), angulosa and dumosa respectively, and gradations connecting them.

The Giant Mallee is one of the prevailing species which, with its varieties and other species, constitute the dense mallee scrub, and play an important part in the natural economy of the desert, aiding to mitigate the excessive heat. The power of the roots of the Mallee Eucalypts to absorb humidity from the soil is very great; it is well known that several species, including this and the one previously described, will yield water from the roots.

The Giant or thick-leaved Mallee produces both nectar and pollen, but the quantity and quality of the former are yet unknown; it flowers in March and April, and is in bud for fifteen months, so that for some time two generations of buds are in sight.

ANGULAR GIANT MALLEE (*Eucalyptus incrassata, variety angulosa*).

(Fig. 37a.)

This is a large-fruited variety of the species described previously, from which it is distinguished by its larger and more angular and streaked buds and fruits, which are usually deeply furrowed, while the stalk of the cluster of flowers is thick, compressed, and upwards, much expanded, and the lid of the bud suddenly contracted into a slender point; the leaves also are somewhat broader than those of the other varieties, so that at first sight this variety is very distinct from the others (Fig. 37B, 37C, and 37D); as, however, there are gradations connecting the different forms, they cannot be looked upon as separate species.

What has been said of the species previously described in regard to nectar and pollen probably also applies to this variety.

THE SMALL GIANT MALLEE (*Eucalyptus incrassata, variety dumosa, Syn. Eucalyptus dumosa.*—A. Cunn.).

(Fig. 37d.)

This variety is classed as a distinct species by Baker and Smith, and described in their *Research on the Eucalypts* as follows:—Found in the interior, and rarely attains to tree form. The bark is white, persistent and smooth. Hence the local name "White Mallee." Leaves from oblong or almost ovate and obtuse to lance-shaped, under 4 inches long, short pointed, fleshy, shining, and of a dull yellow colour; venation fairly prominent, lateral veins distinct, marginal vein removed from the edge. Oil glands quite obscured. Clusters of flowers at shoulders of leaves, bearing a few flowers on short stalklets. Lower part of bud cylindrical, occasionally angular; lid of bud short conical."

This is a prominent Victorian Mallee, large tracts of country being marked on maps of the State as "dense scrubs of Eucalyptus dumosa." Unfortunately, so far, no information as to the suitability for honey production of these large unoccupied areas in the north-west and west are yet available; but, judging by the results obtained on the fringe of the Mallee, this class of country should afford great scope for apicultural enterprise, the Mallee flora being more of a nectar-yielding kind than that of moister districts, and the climate exceptionally suitable during the winter.

THE BLUE MALLEE (*Eucalyptus polybractea*).

(Fig. 38.)

One of the shrub Eucalypts with bluish-green bloom on the foliage, hence the name Blue Mallee; the branchlets are angular, the leaves are

Fig. 38.—The Blue Mallee (*Eucalyptus polybractea* R. T. Baker).

(Illustration from "A Research on the Eucalypts, &c.," by Messrs. R. T. Baker and H. G. Smith.)

lance-shaped (those on the early shoots lance to long lance-shaped) erect, rarely unevensided, narrow, mostly 3 inches long, pointed often with the point curved backwards, not shining, the midrib raised on the underside, giving the leaf a strong resemblance to that of the olive.

The lateral veins are oblique, spreading, finely marked, only occasionally distinctly pronounced, the marginal vein *removed from the edge*. Oil glands very numerous. The flower clusters on short stalks at shoulders of leaves bearing from eight to twelve flowers; buds angular, with a frosted appearance in the early stages of development, and surrounded

Fig. 39.—The Green Mallee (*Eucalyptus viridis syn. acaciodes*).

by numerous pointed ribbed whitish bracts (small leafy appendages), from which distinguishing feature the botanical name "polybractea" is derived. The lower part of the bud tapers conically into a short stalklet, while the upper end or lid is blunt, or only very slightly pointed; fruit half-round to pear-shaped, and frosted in appearance.

The Blue Mallee differs from others in never attaining tree form; by the above-mentioned bracts surrounding the buds and their angular shape; by the leaves; the four-cornered branchlets and the whitish or bluish bloom which is characteristic of this species.

THE GREEN MALLEE (*Eucalyptus viridis, Syn. Eucalyptus acaciodes*).
(Fig. 39.)

A Mallee of dense growth, the stems usually 2 to 3 inches in diameter, though occasionally measuring 20 feet in height, it rarely grows to tree size. Bark smooth, or only rough at the base of the larger trees. Sucker leaves constantly narrower than normal leaves. Leaves erect, narrow, lance-shaped to almost linear, mostly 2 to 4 inches long, pointed or blunt-ended, not shining, but of a rich green colour, a feature from which both the vernacular and the botanical name is derived. The veins of the leaves are rather obscured, spreading, the marginal vein not far from the edge. Flower clusters at shoulders of leaves, bearing from seven to twelve flowers. Buds pear-shaped, with half-round, short-pointed lid; fruit pile-shaped, with a thin rim contracted at the edge.

The bark is of a fibrous nature, but not deeply furrowed, and of a peculiar rich yellow colour on the inner side. Timber dark and close grained, interlocked, yellowish-coloured. Being a Mallee, it is only rarely found in tree form, when it has a tendency to become hollow in the stem.

As in the case of the one previously described, no information can yet be given as to its habits of flowering and its value for honey production.

(To be continued.)

APPLE SYRUP—A NEW PRODUCT.

Following extensive experiments begun last spring, the head of the Fruit and Vegetable Utilization Laboratory of the Department of Agriculture (United States of America) has applied for a public service patent covering the making of a new form of table syrup from apple juice.

This patent will make the discovery, which the specialists believe will be of great value to all apple-growers as a means of utilizing their culls and excess apples, common property of any cider mill in the United States which wishes to manufacture and sell apple cider syrup.

The new syrup, one gallon of which is made from seven gallons of ordinary cider, is a clear ruby or amber-coloured syrup of about the consistency of cane and maple syrup.

Properly sterilized and put in sealed tins or bottles, it will keep indefinitely, and when opened will keep under household conditions as well as other syrups.

The syrup can be used for griddle cakes, cereals, household cookery, and as flavouring in desserts.

During the process of manufacture, which is described, calcium malate is produced as a by-product. This is sold for medicinal purposes at the rate of two dollars per pound.—[Extract from article in *Pure Products*, November, 1914.]

THE MAIZE-PRODUCING INDUSTRY IN VICTORIA.

By Temple A. J. Smith, Chief Field Officer.

(Continued from page 592.)

DRYING OR CURING.

After the maize is husked the cobs are dried out, either in cribs—sometimes called bins—made of saplings or sawn battens, 6 to 8 feet wide, and about 12 feet high. The floor should be at least 12 inches off the ground to allow of free circulation of air, and to prevent the soil moisture affecting the cobs. The saplings or battens should be from 1 to 2 inches apart, and it is advisable to line the whole with wire netting, particularly when parrots are numerous. Large cribs should have battens round the sides, to about half the height of the crib, to take the weight of the maize, otherwise the netting will bulge and break. Floors or lofts are often used, on which the cobs are emptied promiscuously to a depth of from 2 feet to 3 feet.

In the case of both cribs and sheds, a roof is necessary to keep out the rain—corrugated iron being the best material. The drying process takes two to three months, during which time a loss in weight of up to 20 per cent. takes place, due to evaporation of moisture. There is at the same time a considerable shrinkage owing to the same cause.

THRESHING.

This is done, as a rule, in November and December; though, should good prices rule, the cobs can be threshed earlier. Maize, after being dried, will absorb moisture again to a small extent, and will, therefore, thresh better after a dry spell than following wet weather.

Threshers are made of different powers, from hand-shellers with a capacity of 10 to 15 bags a day to steam-power machines with a 200-bag capacity. The average cost of threshing by these machines is 4d. per bag. If maize is threshed before being properly dried, the grain will mould in the bags, and care should be taken to obviate such a condition.

MARKETING.

This is a matter to which the Victorian grower might perhaps with profit apply some study. The history of our markets shows that maize has on many occasions fallen in price below its true feeding value. In 1904 the price was 2s. 4d.: 1905, 3s. 3d.; 1910, 2s. 11d.; 1911, 3s. 3d. per bushel. The maximum price was reached in 1902, when 4s. 10d. per bushel was obtained. On these figures, it is doubtful whether the maize-grower has been making as much profit as might have been the case had he fed the crop to pigs. No less than 60 per cent. of the maize grown in the United States of America is fed on the farm. This is a very large proportion, and the reason for such a condition of things must be that the practice of feeding is the most profitable. Ten per cent. is sold for feeding purposes to local buyers, and 25 per cent. goes into the general market. Only 3 per cent. is exported Many experiments have been carried out in America to prove the value of maize

for feed, the results of which show that, on an average, a little less than 6 lbs. of maize in the cob is sufficient to produce 1 lb. of pork. Taking maize at 3s. 6d. per bushel, the average price over ten years in Victoria is ⅔d. per lb. On these figures, it takes maize to a value of 4d. to produce 1 lb. of pork worth the same amount; therefore, it would pay better to feed when pork is over 4d. per lb. than to sell as grain at less than 3s. 6d. per bushel; and pork averages more than 4d. per lb., ranging up to 7½d.—nearly double the average market value of the grain. Where maize-growing and dairying are combined on the farm, the skim milk fed with maize is increased in value. Maize fed in the cob gives almost as great feed value as maize meal, the difference in favour of meal failing to compensate for the cost of crushing and carting to and from the mill. The expenditure incurred in threshing is avoided, and also the carting to a market. This latter is a considerable item in many cases. The manure from the pigs also carries a certain value.

The effect of feeding a large proportion of the crop on the farm would also have some influence on the price of maize in the general market, regulating the supply for general requirements.

Growers should always endeavour to send a good, clean, bright sample of maize, of the colour and size needed. The colour at present in favour is a rich yellow with a tinge of red, and a deep, wedge-shaped, flat and large grain.

Good bags should be used, and these should be branded with the owner's intitials or special brand. Uniformity in all respects in a parcel of maize, or any other product, appears to exercise a special influence in favour of prices.

Maize Stalks.

In Victoria, little use of the stalks after the ears have been harvested has been made, beyond the fact that stock have been turned in to get what fodder-value they could. In America, large quantities of the stalks are shredded and made into stover, and used with other foods for stock; the system prevents waste, and provides the best means of utilizing the residue of the crop. A similar method in treating the stalks might be worthy of consideration by our local growers.

Apart from the question of waste as fodder, not enough importance is attached to the value of the stalks when ploughed in to supply the soil with humus. Quantities of stalks are cut and burned which should be worked into the land as manure. In this way, heavy, stiff soils are improved in being opened up, for, as the maize stalks rot, they drain the land and cause air passages to form, and render the soil more friable. Sandy soils deficient in humus receive a supply of this necessary constituent of all soils, equal, in some respects, to a dressing of farmyard manure. Probably, one reason why stalks have been burned or carted away in the past is due to the fact that they are difficult to plough under when 6 to 12 feet long; but nowadays, when machinery is available to cut them into short lengths, this objection is removed. The proper way to deal with stalks is to roll just to flatten them down in one direction, and then to cut the stalks into 6-in. to 12-in. lengths, with a heavily-weighted straight-disc implement or roller, on which heavy steel cutters are fixed. These short lengths

cover well and decompose quickly. Care should be taken to plough stalks in early, at least a couple of months before the sowing season, to give all coarse material time to rot—a process which takes place at a greater rate when the soil is moist. The work of rolling, cutting, and ploughing-under is certainly not greater than cutting, raking together, and burning-off.

Maize stalks can also be utilized in some cases for silage when the cobs have been harvested early, and before the frosts have killed the leaves. Where the stalks are on the dry side for this purpose, water is added through a sprinkler to provide the 80 per cent. of moisture required in silage. As a rule, however, the stalk is allowed to get too dry before the maize is harvested to allow of it making satisfactory silage.

The pith of the ear is also of value when ground with the grain, giving the meal better fattening qualities than the meal made from the grain alone. This is not so much due to its having a higher nutritive value, as to the fact that the pith mixed with the grain renders the meal lighter and more digestible.

Crushing machinery is made by Melbourne manufacturers which gives excellent results.

Diseases and Pests.

The maize crop is probably freer than any other from disease, and in Victoria particularly so, and such troubles as root-rot, flag-rust, and smut, are, with the exception of the last-mentioned, almost unknown.

In respect to smut, which is liable to make its appearance in the ear and the flower, the damage sustained up to the present time has been slight; this, however, is no reason for neglecting to take precautions in regard to its spreading. There is a risk, too, of great trouble in the matter of diseases and pests being at any time introduced with importations of maize from foreign countries; and, where any such cases occur, they should be at once reported to the Agricultural Department for investigation and treatment to prevent spreading.

Mr. D. McAlpine, formerly Victorian Government Pathologist, in his book on the *Smuts of Australia*, states that Head Smut of maize (*Sorosporium reilianum*) is the only smut of maize known in Australia, and it is spreading in districts where maize is largely grown. It attacks the cobs and tassels, and is usually confined to them, though it appears in exceptional cases on the upper leaves. The smut is enclosed at first in a pinkish membrane, which soon ruptures in order to allow the escape of the spores. It has probably been introduced from Europe.

The mode of infection has not been determined, but formalin and hot water treatments of the seed are ineffective, and probably it does not occur through the seeding.

The best means to prevent the spread of the trouble is to procure seed from pure sources and districts not affected. Should, however, smut be detected in the crop, all leaves, flowers, and cobs showing signs of the disease should be collected, as soon as noticed, in bags and burned carefully, bag and all.

A change of crop in the land used for a few years is also advisable. The spores of the disease being of short life, they can be starved out by such a method.

Moulds or Mildew.

The most common moulds found on maize are known as "Panicillum" and "Aspergillus," which make their appearance when the maize is allowed to become damp, either due to its green condition when harvested, or the admission of moisture from without. These diseases develop fast, and destroy the feeding value and seed value of the grain. Maize so infected is dangerous to feed to stock of any kind, includin poultry. The only practical cure is to keep the maize dry and allow free circulation of air through the cobs. Leaving the cobs in the husk too long, particularly if they have been picked on the green side, is one of the most common causes. Where kiln-drying is possible, the trouble can be checked and cured by submitting the maize to heat, beginning at 80 degrees F., and carrying it slowly up to 120 degrees F.

Insect Pests.

Cut-worms, which attack the young plants soon after germination, are the greatest pest in Victoria so far as insects are concerned. They are usually worse on early-planted maize than on that sown later in the season. They feed at night, generally just below or at the surface of the soil.

The remedy for this pest lies in early and constant cultivation. Applications of lime in the autumn also have a good effect. They can also be killed in great numbers by sowing baits made of arsenic or Paris green 1 lb., bran 20 lbs., and sugar 2 lbs., mixed with water sufficient to form a mash which will not stick together, so that it will easily separate when spread over the affected field. It should be sown broadcast over the field after sun-down, so that it will not become dry, and is then greedily taken by the cut-worms.

Where insect pests, particularly applicable to growing maize, are consistently bad, a change of crop for a couple of years will have a beneficial effect.

Weevils, which attack the grain, are often a source of trouble, and are difficult to deal with.

Where the grain is stored in rooms, or other places that can be tightly closed, fumigation with carbon bisulphide is the best treatment—about 3 lbs. of the liquid being required for every 100 bushels of grain. Pour about ½ lb. of the carbon bisulphide into saucers, and place on the top of the bags, or soak a handful of cotton waste and place this also on top of the maize. The gas formed is heavier than air, and will penetrate all through the maize and destroy the weevil. No open light should be allowed to come near the fumes, as they are highly inflammable; and the room in which the carbon is used should be well ventilated after treatment, as it is dangerous to breathe air heavily charged with the gas. Twenty-four hours is sufficient time to keep the room closed to kill the weevil.

CONSERVE THE NATURAL PASTURE.

Stack Silage.

By G. H. F. Baker, Dairy Supervisor.

In such a bountiful season as this, every means that can be employed of saving the surplus growth of natural herbage and fodder on old cultivation paddocks to tide stock over leaner years should be adopted. One cheap and easy system of doing this is stack silage. By this expeditious method a great amount of green fodder can be conserved almost indefinitely without sacrifice of any of its succulence. If wild oats, trefoil, clovers, crowfoot, barley grass, kangaroo and other varieties of grasses, be treated in this way, a reserve of fodder is established which will undoubtedly be found welcome when the seasons again fail. This, in addition to value procured, is the most rational system of eradicating wild oats and other objectionable weeds, as it catches them before they shed their seed.

A stack of silage is built in the same way as a stack of hay. The necessary precautions to take are to guard against building the stack large in area and low in height, as a large amount of green material can be placed in a small area. Therefore, material sufficient to build a high stack is essential to success. As the necessary exclusion of air cannot be effected without pressure, loftiness in an ensilage stack is a virtue and will always pay for the additional trouble it entails. To insure this, the initial error of starting the stack too large should be avoided. Hay stack dimensions are of no value for silage stacks. In general practice, it is found that one-fourth the area of a ton of hay will hold a ton of silage.

During building, the stack should be weighted every night after ceasing work. This can be done by suspending weights on wires across the stack, or placing some weighty material on it. Finish off the stack in a suitable shape to resist the weather, and weight it to assist settling and exclusion of air.

Several devices for weighting stack silage have been tried, but none are so satisfactory as the dead weight on top. It is ever doing its duty and does not require any attention after being placed there. Logs, stones, sand, bricks or earth may be used for weighting. One good plan is to make a framework of heavy saplings. Lay these around the edges, cutting notches in them so that they will fit into each other where joined; then fill between them and all over the stack with earth. This device will do good work and give satisfaction.

To expedite the building of the stack to the necessary height, the three following labour-saving elevators have been successfully used:—

First method.—Is the swinging hay stacker, which is fully described and illustrated in the June, 1909, issue of the *Journal of Agriculture.*

Second method.—Is to attach blocks and tackle to a stout limb of a suitable tree sufficiently high to allow the stack to be carried to a fair height. By the aid of a horse the load can thus be elevated and deposited bodily on the stack. It is necessary to have a quiet staunch horse with some weight for the work; otherwise have a third block attached to the bottom of the tree to keep the draught low.

Material required—80 feet of 2-in. rope, 1 double block, 1 single block, 35 feet 1-in. rope—as net for each dray in use—it will be wise to have an extra net to prevent delay of drays at stack.

Third method.—Is to elevate the load with a horse by means of a pole to which a spar, pulley blocks, and rope have been attached. To do this it is necessary to procure a strong sapling 30 feet long by 10 inches at the butt and a spar 12 feet long by 7 inches at butt. Fasten the spar to the pole 10 feet from the top by means of a toe piece on the point of the spar which fits in a projecting hole of an "L" piece bolted to the pole, connect the top of spar to top of pole by a strong chain in such a manner that the spar or gaff can be turned so as to deliver the load at any part of the stock. Place a double block at the point of the gaff, a single block beneath junction of gaff and pole, and a single at the foot. Take one end of 140 feet of 2-in. rope and fasten to the bottom of the double block which is attached to the point of gaff, then thread the rope over one pulley wheel in an additional loose double block, then back through the fixed double block, back again through the loose double block, up again through the fixed double block and down to the single block at junction of gaff and pole, then on to the single block at foot of pole, make a loop in end of rope to attach a swingle-tree, which has a release clutch hinged in back. Now all is ready to hoist the elevator, first select the site for stack of silage and in the centre of easiest and most conveniently approached side of site sink three stout planks 4 feet long (2 feet in the ground and 2 feet out). Place the butt of pole against these posts, then fix three guy ropes to top of pole, take these ropes out in opposite directions and at equal distances apart, sink three short posts into ground, placing them at a sharp angle so that the ropes will not slip off when the pole is being raised. Wind the loose end of rope around these posts. Then by aid of two quiet horses or a crab-winch and two men at the guy ropes, lift the pole upright.

Before making use of horses to get the pole in an upright position it will be necessary to raise the top end of pole off the ground 10 feet. This can be done by hand with the aid of a pair of shear legs. The men at the right and left guy ropes will take in the slack and at the same time keep the pole going straight. Should the pole get too much of a list to either side, stop the horses and straighten pole, then off again till it is in position. Make secure by tightening up all guy ropes. When this is done everything is ready to elevate the fodder which can, by the aid of this elevator, be built to a height of 20 feet to the eave.

Material required for this elevator—

Strong sapling, 30 feet long, 10 inches diameter at butt.
Spar sapling, 12 feet long, 8 inches diameter at butt.
2 bolts for attaching chain on spar and pole.
1 chain 10 feet long.
1 L-piece with two bolts to bolt on pole.
1 toe-piece for gaff to fit in L-piece.
2 double blocks for 2-in. rope.
2 single blocks for 2-in. rope.
140 feet rope, 2-in.
3 guy ropes, 50 feet.
35 feet of 1-in. rope for each dray in use with an extra 35 feet as a spare net.

SULPHITING AND THE WAR.

By F. de Castella, Government Viticulturist.

M. L. Roos contributes an article to *le Progres Agricole*, of Montpellier (France), in which he warned wine-makers of the difficulty they would experience in obtaining supplies of bisulphite of potash for the then approaching vintage (the French vintage takes place in September and October).

Mr. Roos is familiar to Australian vine-growers, owing to the translation of his work, published by the Department of Agriculture some years ago, under the title of *Wine Making in Hot Climates*.* The warning he has recently given to French cellar-managers applies with equal force to wine-makers in Australia. Hence a few extracts from his article will prove of interest.

In the first place, he points out the remarkable popularity which the process of sulphiting has attained. All that was claimed for it five years ago has been fully realized; so that the judicious use of sulphurous acid in wine-making can now be looked upon as a standard method.

> "Sulphiting has become a more or less general operation in the cellars of the Midi (South of France), and of Algeria. So far as bulk wines† are concerned, its effects are no longer discussed, and it may be affirmed that wines resulting from sulphited grapes are incomparably superior to others, from the triple stand-point of flavour, of colour, and of keeping power."

This emphatic recommendation from so competent an authority merits careful consideration by the few Australian growers who still hesitate to apply sulphiting.

Reprints of the articles describing the process, which have appeared in this *Journal*, are obtainable on application to the Department of Agriculture. In these it was pointed out that the most convenient source of sulphurous acid (SO_2) is the salt commonly known as bi-sulphite of potash, which is in reality a pyro sulphite ($K_2S_2O_5$). Prior to the outbreak of hostilities, this salt was imported from Germany by French as well as Australian wine-makers. Mr. Roos points out the difficulties vine-growers will have to face in the way of securing, not only bi-sulphite, but several of the other forms of SO_2.

> "The state of war has radically changed the conditions of production in the chemical industry, so that we will not be able to choose this year between the different forms of sulphurous acid . . . . . Sulphurous acid liquefied under pressure can scarcely be supplied by more than one French factory; its production will be much restricted, and quite incapable of meeting the demand caused by the total deficit of bi-sulphite . . . . the price of which . . . . has already more than doubled.
>
> Dissolved sulphurous acid—the acid of commerce, often known in Australia as S-ous—will be fairly scarce, as will also the complex phosphated sulphurous solutions which have succeeded in obtaining the preference of numerous vine-growers.

* Wine Making in Hot Climates.—L. Roos, translated by Dubois and Wilkinson. Obtainable from the Department of Agriculture, Melbourne, price 1s., postage, 5d.

† The cheaper wines grouped under the general term of "Vin ordinaire," which are the universal beverage in France, are handled in and consumed from bulk. It is only expensive wines which are able to support the heavy cost of bottling.

> Bi-sulphite of potash was almost wholly supplied to us by Germany. German importations being completely shut off by the war, there will be a shortage of some hundreds of tons of bi-sulphite of potash this year. French factories capable of turning out this substance have not been able to equip themselves for this manufacture soon enough, being prevented by the duties they have had to accomplish for the Army, or by other reasons. As a matter of fact, bi-sulphite to-day is non-existent, nor will it exist more plentifully by vintage time; so that very many vine-growers who were in the habit of using it must now think of replacing it."

Bi-sulphite of soda is next dealt with. In solution, it should be only bought subject to guaranteed SO_2 content. In the solid form, it is a product which continually liberates SO_2, hence its composition is very variable. As for crystallized sulphite of soda, it may be relied on to yield 25 per cent. (by weight) of SO_2, and the anhydrous sulphite 50 per cent., just as bi-sulphite of potash does.

The possibility of manufacturing one's own SO_2 by simply burning sulphur is next dealt with. Fortunately, sulphur does not come from Germany, hence a scarcity of this substance is not imminent. Mr. Roos points out how sulphur burning in air produces twice its weight of sulphurous acid. This substance is supplied in the shape of a gas, mixed with the nitrogen of the air which served to burn the sulphur. *Admitting that the dose necessary for effectual sulphiting be 10 grammes* per hectolitre of SO_2 (practically 1½ ozs. per 100 gallons), this would be *supplied by ¾ oz. of sulphur; but there is difficulty in obtaining the* absorption by the grape juice of the whole of the SO_2 produced by the combustion. Theoretically, it is possible to burn 3 ozs. of sulphur in 100 gallons of air, and in practice, about 2¼ ozs.; but it is necessary to burn this in the upper part of the cask, otherwise the sulphur will be extinguished by the SO_2 produced, which, being heavier than air, accumulates in the bottom of the cask. There are also difficulties in the way of getting sulphur to burn properly. Flowers of sulphur are very unsatisfactory in this respect. Bar sulphur is better, but melts and runs as it burns. Mr. Roos mentions a form of sulphur which does not run, recommended by M. Pelletant, of Beziers. This is a mixture of sulphur and starch containing only 2 or 3 per cent. of starch, enough though to provide the formation during combustion of a very porous charcoal which absorbs the melted sulphur. This is prepared by making a paste of powdered sulphur and starch water. This paste may be cut or moulded into any desired form, and then dried.

The next point is to secure the absorption by the grape juice of the whole of the SO_2 produced. In the ordinary way absorption is anything but complete, a good deal of the SO_2 being driven out through the bung-hole by the ingoing juice without being absorbed by it. Complete absorption can be secured by the use of special apparatus such as those figured on pp. 174 and 175 of *Wine Making in Warm Climates*. Even without recourse to these appliances, fairly complete absorption can be obtained by the simple expedient of fixing a *small copper plate in front* of the jet which delivers the wine into the cask; this is kept in place by *two wires so as to constitute a sort of stirrup attachment.* Such an arrangement causes the wine to fall into the cask in a fine shower, which absorbs the SO_2 so completely that the loss does not exceed 5 per cent.

Mr. Roos next points out how to turn this to practical account. Suppose one desires to sulphite at the rate of 12 grammes of bi-sulphite per hectolitre (nearly 2 ozs. per 100 gallons), a low dose, but sufficient for sound grapes; all that is necessary is to burn the sulphur at the rate of 1 oz. per 100 gallons in a cask one half the size of the vat to be filled. The juice is run out of the vat, pumped through the special jet into the cask containing the SO_2 resulting from the combustion of the sulphur, and thence back to the vat again. In other words, the must is sulphured in a separate cask and pumped back after it has been thus sulphited.

In conclusion, Mr. Roos points out that though it is easy to understand wine-makers' preference for bi-sulphite, in spite of the lack of this substance, wine-makers can still sulphite their vintage at the cost of a little extra trouble by means of SO_2 resulting from the combustion of sulphur.

Those wine-makers who have not yet secured supplies of bi-sulphite have thus other means of sulphiting their wines even if this salt should be unobtainable. It is interesting to find the Soda Salt recommended by Mr. Roos. No objection can be logically raised to its use; since the outbreak of war prominent authorities in Great Britain urge that Sodium Salts should replace the corresponding Potassium Salts wherever possible. This presents an economic as well as a hygienic advantage, as the Sodium Salts, in addition to being much cheaper, are also less toxic.

A commercial Bi-sulphite of Soda solution is obtainable locally, which contains 20 per cent. of SO_2. The wholesale price for this at present moment is about 10s. per cwt., a little under 10d. per gallon. It should really be a very economical form, seeing that it costs very little more than the Sulphurous acid solution, which only contains 5 per cent. of SO_2.

Dissolved Sulphurous Acid has, however, been somewhat extensively used in the past, and will, no doubt, continue in use, hence the following particulars concerning it may be given:—

In France the standard or legal solution is one containing 8 per cent. of SO_2. In Melbourne the B.P. (*British Pharmacopœia*) solution is the usual one. This contains 5 per cent. SO_2* and has a specific gravity of 1.025 (3.5 degrees Beaumé). It is worth noting that the percentage in any solution of the gas corresponds almost exactly with the decimal figures in the specific gravity divided by 5.† The French 8 per cent. solution would be thus of specific gravity 1.040, or 5.5 degrees Beaumé. The *British Pharmacopœia* solution is quoted at about 8s. per cwt. wholesale.

The figures the wine-maker will find it convenient to remember in connection with the use of SO_2 are as follow:—

In order to obtain 1 oz. of SO_2 he will require to use—

- ½ oz. Sulphur (burnt).
- 1 oz. SO_2 liquified under pressure.
- 2 ozs. Bi-sulphite of Potash.
- 2 ozs. Anhydrous Sulphite of Sodium.
- 4 ozs. Crystalline Sulphite of Soda.
- 5 ozs. Bi-Sulphite of Soda solution @ 20%.
- 20 ozs. Sulphurous Acid B.P. (S—ous) @ 5%.

* Equivalent to 6.4% expressed as H_2SO_3.
† Squires *Companion to the British Pharmacopœia*.

THE WALNUT.

(Continued from page 473.)

C. F. Cole, Orchard Supervisor.

GRADING.

This most important work of grading should not be overlooked by the grower if he wishes to realize the highest market value for his walnuts.

Nuts graded with regard to size, colour, and general quality, separately packed and branded with a grade mark, will realize more upon the market than if the nuts are ungraded and sold as a bulk lot. Growers should try to secure the highest ruling prices for their walnuts. To achieve this, grading must be practised, otherwise the purchaser will probably grade and sell at enhanced values. Information gathered by the writer from several growers who do not grade as to prices obtained, shows that they realize 4½d. to 6d. per lb. in bulk, while others, who grade, receive from 6d. to 9d. per lb., according to sample.

The practice of grading is not general in Victoria, and where adopted is not upon systematic lines, chiefly owing to the haphazard method adopted in the past of planting non-selected types. The nuts, consequently, are not of a sufficiently distinctive type to warrant careful grading.

When harvesting nuts, certain varieties of similar form should be kept together as much as possible. Oval, elongated-shaped nuts should be kept separate from those of a broadly oval or rounded form. Plate 30, Fig. B, is an elongated type that should be kept separate and not graded with Plate 30, Fig. A, belonging to a short, rounded type. Both nuts, however, belong to grade No. 1.

Nuts similar, or of a type, have a much better appearance when graded and kept separate, than if mixed with nuts of different form.

Compare nuts illustrated in Plates 30 and 31; some of these will not pass through 1 3-16 square inch mesh if in a horizontal position, but if in a vertical position will do so. These nuts should not be graded together.

Owing to the small quantity of nuts produced in Victoria, grading by hand should be adopted in preference to selling the nuts ungraded. If in the future walnuts are produced in quantity for commercial purposes, grading by machinery or other means must be adopted. In America nuts are graded chiefly over horizontal screens which are shaken backwards and forwards by machinery so that the smaller nuts drop through the various meshes, and all sizes are carried automatically on to belts which elevate them into bins. Grading for quality is done by picking and rejecting discoloured or otherwise objectionable nuts by hand. After carefully inspecting several harvested crops, I would recommend grades as follows:—*Specials.*—These are nuts that will not pass through a 1 3-16 square inch mesh screen. *No. 1 Grade* nuts that

will pass through a 1 3-16 square inch mesh. *No. 2 Grade* nuts that will pass through a 1 2-16, but not through a 1 square inch mesh screen.

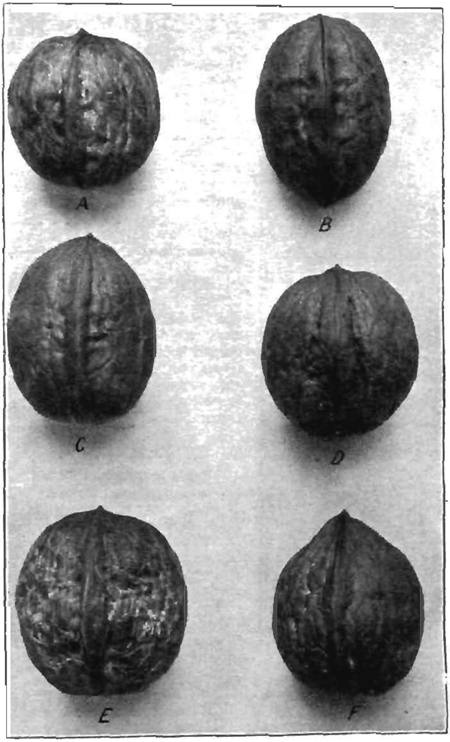


Plate 30.—Various Selected Types of Victorian English Seedling Walnuts, Natural Size.

No. 3 Grade, nuts that will pass through a 1 square inch, but not through a ⅞ square inch mesh. Any nuts that pass through the ⅞-inch mesh or

THE PROPAGATION OF CULTURE STARTERS FOR CHEESE-MAKING.

By G. C. Sawers, Cheese Expert.

Many cheese-makers seem not to realize that the starter they employ is a living agent, and that for the best results its vitality or potency must be fully maintained.

Disappointment often results from want of knowledge as to the most favorable conditions for the growth of the starter ferment.

The practical difficulty is to propagate the starter from day to day and preserve it in an active pure condition.

Instead of being successfully propagated for a month, as it might be if more suitable methods were adopted, the lactic ferment, in many cases, in a short time, often in a few days, becomes comparatively dormant, and the starter subsequently alters in character until it is evidently impure.

The original ferment has been obliged to give place to others of a less desirable type.

The method of propagating cultures described below have proved very satisfactory

There are at least two distinctly different classes of starters—home-made or natural starters, which may be ordinary milk, allowed to sour naturally; and commercial or culture starters, prepared by bacteriological methods in the laboratory. But in all forms of starters, home-made and culture alike, the active principal consists of bacteria germs, or microbes. In home-made starters, there may be present any number of different species of germs, the number of species varying with the origin of the starter and the conditions under which it has been prepared.

The purity of a starter depends upon the number of species of bacteria present, and the purity of a home-made starter which has been originated under ordinary dairying conditions, will be a varying and unknown quantity.

A commercial or culture starter is, on the other hand, procured from a bacteriologist, and should be either a pure culture containing one species of bacterium only, or a culture of two or more species containing only germs especially selected to produce a desirable ripening, and bring about the kind of fermentation which has been found in practice to give the best results.

After thoroughly washing and sterilizing a composite bottle which is marked off in ounces, procure the best milk obtainable, and as fresh as possible.

Put one pint of milk in a clean vessel, and set in clean boiling water, and scald same up to 185 degrees, and maintain that temperature for fully half-an-hour, and give it a stir occasionally with a clean glass rod. Remove the cream that forms on top, and cool the milk to 75 degrees Fahrenheit.

Obtain a bottle of lactic acid ferment powder of a well-known brand, and withdraw the cork and place ½ ounce of powder in the composite

bottle. Replace corks immediately, and seal down the cork of the lactic acid ferment powder bottle with beeswax or paraffin to prevent any germs from getting in, and set away in a cool place protected from direct sun light.

First Propagation.—Remove the cork from the compost bottle and pour the milk in up to No. 6 mark, replace stopper, and shake the contents for a few minutes, so that the powder is thoroughly mixed in the milk. Do this at intervals for the first four hours.

Set the bottle in water at a temperature of 75 degrees Fahr., maintaining even heat from eighteen to twenty-four hours, when the startoline should be nicely thickened for the purpose of starting more fresh pasteurized milk.

Second Propagation.—Discard about 2 ounces from the top, then shake up the contents and pour the remainder into a clean cup, and cover top with clean muslin cloth, then rinse the bottle with cold water, and wash out in hot water with small quantity of soda added, and then sterilize with steam.

Put ¾ ounce of the culture from the cup into the compost bottle and add freshly pasteurized milk up to the 6 mark again, after having lowered the temperature to 70 degrees Fahr., and maintain for the same period as for first propagation.

Third Propagation.—An acidimeter test can be taken to ascertain the acidity, which should show .65 per cent. at least.

Repeat the first operations described under second propagation, but retain only ½ ounce to be added to the 6 ounces of pasteurized milk, and cool down to 65 degrees, and keep at about that temperature until the following day. Four ounces of this culture, if clean and mild and smooth, testing .85 per cent. acidity, will be found sufficient to propagate 2 gallons of pasteurized milk at a temperature of 65 to 70 degrees. This is equal to about 1¼ per cent. of starter. Portion of this starter may then be retained to carry on operations in the usual manner from day to day, so long as it retains its purity.

All tinware used for scalding the milk and setting the starters should have a smooth well-tinned surface, free from rust, and cloths required for covers should be thoroughly washed out, and rinsed in scalding water, and wrung out. This prevents any dust or flies from getting in. The best way to sterilize the utensils is to boil for twenty minutes in water in which has been dissolved ½ per cent. of washing soda, *i.e.*, about a teaspoonful to a pint, or two tablespoonsful to a gallon.

SUMMER FODDER CROPS.

By Temple A. J. Smith, Chief Field Officer.

Pamphlet free on application to Director of Agriculture, Melbourne.

WOOL TERMS.

"Bales," "Butts," "Sewdowns," "Fadges," and "Bags."

By H. W. Ham, Sheep Expert.

BALES.

On farm holdings, or in transit, it is usual for any quantity of wool enclosed in the customary jute woolpack to be termed a bale. But once in store on sale for export one of the rules of the Wool Buyers' Asso-

This bale of wool grown by Mr. R. H. Hinchcliffe, a farmer of Ararat, was selected with the assistance of Messrs. Geo. Hague and Company, Geelong, for exhibition at the Panama Exposition. San Francisco. It helped to win for Victoria the Gold Medal against the world's competitors. An offer from one of the American Universities to purchase it at the conclusion of the Exposition will probably be accepted.

ciation demands that "no package shall be considered a bale unless it be contained in a woolpack, be in shipable order, and weigh at least, for greasy wool, 200 lbs. gross."

This rule is comparatively a new one. It has been instituted because of the steadily increasing number of light-weight bales sent in by growers in recent years. For this there are several causes. Growers of high-class wools, more particularly smaller breeders, have learnt that most classes of wool open up more attractively if not too tightly pressed.

Also, that the larger the number of bales in one line, the more attention is given to it, and the better the competition. And, as well, a matter which affected the small grower most, all lots of three bales and under, known as "star lots," are sold in separate sale-rooms, and are bought mainly by buyers' assistants, and thus by making four light bales instead of three of the average weight, a "star lot" was often avoided, and competition in the main sale-room gained.

Buyers had their reasons for complaint also. They receive their orders to purchase in number of bales, and their commission for buying is at per pound. Charges to them from store to ship's side are at per bale. It is, then, from their view, only reasonable that a fair quantity of wool should be in each bale. As well, the increasing number of bales in proportion to the total weight of wool on offer, meant extra time in examination.

Neither should bales be excessively heavy. Greasy wool opens up less attractively when over three and a half hundredweight. Bales of this weight and over, especially cross-bred, apart from being inconvenient to load and stack, are often found so tightly pressed that buyers find a difficulty in drawing from flapped bales sufficient wool to examine well, unless in every case the cap be entirely removed, which, as a rule, means extra re-packing charges to the grower.

One of the best recommendations for the contents of a bale of wool is its outward appearance. All bales should be branded boldly and legibly on the long and narrowest side. This allows of opening the bales by what is known as "flapping," as well as more bales being exhibited side by side on a given floor space. All brands face the passage ways. These, and the weight of each bale, must be placed where readily seen by the buyer when examining. He has to guarantee the "average yield," viz., the weight of clean scoured wool that will be obtained from each order.

The weight of each bale, together with the apparent condition of the small proportion of wool he can examine from each bale, is his main guide.

Branding is more neatly done with stencil-plates and branding ink, the latter can be obtained in either cake or liquid form. Marks put on by hand with sheep branding oil, or paint are most unattractive. In sewing down the cap the "lock stitch" is preferable; if any one stitch becomes broken or cut in transit, the others hold.

Use blue twine, the loose portions, when bales are cut open, are more easily detected. Grey twine portions often pass through all operations, up to the dyeing processes, before being detected.

Patent bale fasteners, peculiar shaped hooks, are used in many cases in place of sewing with twine. Occasionally odd ones escape notice, and pass into the machinery.

The latest method is one in which blue twine stitches take the place of the metal hooks, only six stitches in all being used.

Except for the purpose of checking on large holdings or on trucks, it is not necessary to brand on the ends. Brokers brand on one end on receipt in store for their own convenience in extracting sample bales from owners' stacks as required. One end should always be left clear for buyers' destination marks.

The usual jute pack is sufficient for ordinary wools. Paper-lined packs are only warranted in the case of best "lambs" and all grades of superior fleece.

BUTTS.

Short, pressed portions of bales, quarter and half-size, usually the final clearing up of the various classes from wool bins at the conclusion of the shearing of large flocks.

SEWDOWNS.

Woolpacks filled to their extreme length, with bulged sides, the cap pulled over and sewn down all round on top. In many cases also branded carelessly without the use of stencil-plates and proper branding ink. *Many buyers will not bid for these. Apart from their awkwardness in stacking and placing for inspection, they create a greater feeling of suspicion as to the faithfulness and evenness of the contents than properly-pressed* bales do.

Straw, chaff, fleeces tied with coarse string, binder-twine, &c., fleeces rolled with urine stains and muck balls inside, dead wool with rib-bones intact, have all been found more in sewdowns than in the better-pressed bales.

While unskirted, mixed grades of wool gain little by being in neatly-pressed bales, good, well-prepared wool in sewdowns are at a disadvantage.

FADGES.

This word is used to describe all light-weight bales, no matter how pressed, but more particularly refers to *half and three-quarter sized spade-pressed bales. Light-weight sewdowns, usually from small holdings.*

BAGS

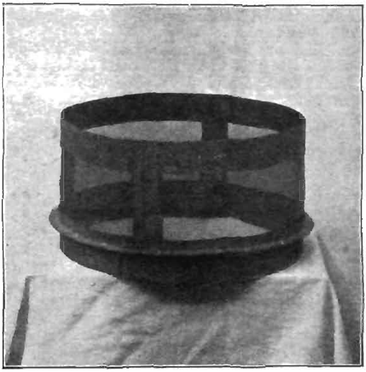
are of all sizes—black fleeces in small sugar bags, quarter and half sacks of locks, stains, &c.; super. and chaff bags, containing rams' fleeces, dead wool, &c.; fleeces from stragglers missed in mustering for shearing.

Under-weight bales, butts, fadges, pockets, and bags are considered by foreign wool buyers as "not in shipable order," and "must be catalogued by themselves at the end of the catalogue, and sold in a separate auction-room."

FLY EXCLUDER FROM MILK OR CREAM CANS.

Mr. H. B. Hooper, Dairy Supervisor to the Kerang Municipal Council, forwards the details of a fly excluder from milk or cream cans.

The article is described "as being about 7 inches high, and of a width equal to the inner surface of a cream can—different sizes for larger or smaller cans. A little above the bottom is a flange to rest on the top of the can. The body portion is cut out of one piece of flat metal, bent to a circle, and the ends joined with open spaces cut out. These are closed by a strip of gauze wire fastened around the inner side, and



giving 3 inches vertical airway. The top is open, and when in use is closed by the lid of the can placed on top."

It would seem that the two main defects in fly excluders seen in the dairies are:—Insufficient play of air above the cream, and the danger of fly-blows or other particles dropping through the horizontally-placed gauze. It is claimed that, by means of the gauze being vertical, the freedom for the movement of air across the top of the can and the protective flange has been attained, and these defects have been overcome

HOME HINTS.

There are many ailments that flesh is heir to which may be quickly relieved or cured by very simple treatment, provided they are attended to in time. Also often the most effective and valuable aids are found in the cheapest material that is nearly always at hand.

Burns and Scalds.—Get threepenny worth of picric acid, place in a wide-necked pickle bottle and fill up with water. So long as there are crystals undissolved keep filling up with water. Swab the part burnt with this picric acid solution. Repeat at intervals until the pain ceases. It is recorded that children that have been badly scalded have been kept in a bath of this material for weeks and recovered.

Sore Throat.—For any form of sore throat a very safe and almost invariably effective treatment is to take as much flower of sulphur as would lay on a threepenny bit and blow into the throat, so that it spreads as far as possible over the whole surface.

For cuts and abrasions apply hazelene and boracic acid.

For sores difficult to heal apply cloths soaked in weak solution of boracic acid (about a teaspoonful to a pint of water).

For Bilious Sickness.—To prevent take a dose of epsom salts, castor oil, or a seidlitz powder on the first indications of an attack. To allay the sickness and prevent vomiting squeeze the juice of half a lemon into half a tumbler of cold water, to which add half a teaspoonful of bicarbonate of soda and drink it. This will nearly always prevent vomiting.

Cold and Influenza.—The first indication of a cold is usually a slight sore throat. A few doses of ammoniated tincture of quinine taken will almost surely prevent further development. Take about 20 drops in a quarter of a tumbler of water two or three times a day. Should the cold settle on the chest rub well with eucalyptus oil. If the patient is a child apply camphorated oil, rub in and on flannel saturated. Camphorated oil is made by shaving up camphor into a bottle of olive oil, in which the camphor will dissolve. The efficacy will be increased by the addition of a little spirit. If a cough should develop take olive oil regularly two or three times a day, half a teaspoonful to a desert-spoonful.

Croup.—A dose of olive oil is the safest and quickest remedy.

Olive Oil.—Always keep on hand a supply of the best Australian olive oil. There is none better; it is almost tasteless. If there is any difficulty in persuading children to take it when they have colds, keep a little in a saucer mixed with sugar, and they will help themselves.

For corns apply glacial acetic acid once a week. Trim off superfluous skin with scissors. Be careful not to allow the acid to run on to the skin surrounding the corn.

A few drops of methylated spirits and soap on cloth will remove obstinate dirt and stains from the skin.

Lemon juice is excellent for removing vegetable stains from the hands.

Gastritis.—½ oz. bitter aloes, ½ oz. Peruvian bark (ground), 3 ozs. best liquorice, 6 dr. tincture of aniseed, 1 teaspoonful bi-carbonate of soda, as much cayenne pepper as will lay on a sixpence, ½ pint water. Boil for one hour and a half, strain through muslin cloth, and then add aniseed. Take a teaspoonful three times a day, and if painful, take an extra dose at bedtime.

STATE RESEARCH FARM.

At the Werribee Show on 21st October, the exhibits from the State Research Farm were the subject of much complimentary comment, and their high standard may be gathered from the prominence attained in open competition, as shown in the prizes won as under:—

HORSES.

1st Prize—Draught stallion (4 years and over)—Major Oates.
3rd Prize—Draught brood mare (all-aged)—Western Princess.
2nd Prize—Wagon team of five horses.
2nd Prize—Light-weight hackney.
3rd Prize—Ladies' palfrey.

CATTLE.

1st Prize and Champion—Red poll bull—Nicotine.
1st Prize and Champion—Red poll cow—Birdseye.
2nd Prize—Red poll cow.
3rd Prize—Red poll cow.
1st Prize—Fat cow—Goldleaf (red poll).

SHEEP.

1st Prize—Border Leicester ram.
1st Prize—Southdown ram.
2nd Prize—Lincoln ram
1st Prize—Merino ewe.
1st Prize—Pen of three lambs (freezers).*
2nd Prize—Pen of three lambs (freezers).†
1st Prize—Pen of three fat lambs.
1st Prize—Pen of three sheep (freezers).
2nd Prize—Pen of three sheep (freezers).
1st Prize—Pen of three cross-bred wethers.

GRAIN.

1st Prize—Bag of wheat.
1st Prize—Three sheaves wheaten hay.
1st Prize—Three sheaves oaten hay.
1st Prize—Three bales lucerne hay.

* The first prize pen of lambs suitable for export were by Southdown ram ex first cross Lincoln-Merino ewes.
† The second prize pen of lambs suitable for export were by Shropshire ram ex first cross Lincoln Merino ewes.

One of the imported Suffolk ewes from the Research Farm was supplied as subject of a guessing competition, and turned the scale at 242 lbs.

A number of non-competitive exhibits were also made, including bundles of lucerne representing the growth on areas subjected to various manurial treatments.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.9.15	15.9.15 to 14.10.15	Six months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
21	White Leghorns	E. B. Harris	657	146	803	1
38	..	*G. McDonnell*	648	154	802	2
53	..	W. G. Swift	660	134	794	3
2	..	E. A. Lawson	634	159	793	4
19	..	L. G. Broadbent	646	140	786	5
34	..	*H. McKenzie and Son*	625	154	779	6
5	..	J. J. West	638	136	774	7
8	..	C. J. Jackson	610	151	761	8
42	..	W. M. Bayles	603	158	761	
9	..	J. Schwabb	599	139	738	10
7	..	Marville Poultry Farm	595	141	736	11
10	..	A. E. Tuttleby	606	124	730	12
6	..	F. Doldissen	597	133	730	
26	..	A. Mowatt	585	135	720	14
44	..	Mrs. F. M. Oliver	576	141	717	15
16	..	N. Burston	585	128	713	16
30	..	A. E. Silbereisen	552	151	703	17
4	..	R. Hay	556	144	700	18
39	..	W. M. Sewell	548	151	699	19
32	..	F. Hodges	552	142	694	20
1	..	Mrs. H. Stevenson	543	147	690	21
18	..	D. Adams	567	121	688	22
50	..	*John Hood*	533	150	683	23
3	..	J. H. Gill	527	154	681	24
54	..	W. G. Clingin	527	152	679	25
11	..	J. B. Brigden	531	145	676	26
59	..	W. G. *Osburne*	522	152	674	27
60	..	H. C. Brock	550	124	674	
49	..	Bennett and Chapman	519	151	670	29
28	..	R. Lethbridge	511	158	669	30
23	..	*Fulham Park*	508	161	669	
25	.. (5 birds)	Giddy and Son	533	134	667	32
13	..	T. Hustler	512	151	663	33
24	..	Lysbeth Poultry Farm	526	136	662	34
33	.. (5 birds)	A. W. Hall	512	135	647	35
15	..	H. N. H. Mirams	497	137	634	36
55	..	W. N. O'Mullane	493	140	633	37
48	..	C. J. Beatty	507	120	627	38
20	..	R. W. Pope	465	150	615	39
47	..	J. C. Armstrong	468	138	606	40
27	..	J. A. Stahl	459	147	606	
43	..	H. I. Merrick	451	152	603	42
12	..	G. Hayman	446	145	591	43
57	..	B. Mitchell	478	111	589	44
52	..	A. A. Sandland	467	122	589	
58	..	Thirkell and Smith	444	144	588	46
22	..	S. Buscumb	429	151	580	47
41	..	*J. A. Donaldson*	441	138	579	48
46	..	R. Berry	430	147	577	49
45	..	South Yan Yean Poultry Farm	439	135	574	50
36	..	*Weldon Poultry Yards*	432	141	573	51
40	..	C. C. Dunn	428	132	560	52
37	..	A. Ross	399	126	525	53
14	..	W. Flood	378	117	495	54
56	.. (5 birds)	*C. Hurst*	372	107	479	55
31	..	L. McLean	321	134	455	56
		Total	29,237	7,866	37,103	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16—*continued.*

Six Birds. Pen No.	Breeds	Owner.	Totals. 15.4.15 to 14.9.15.	15.9.15 to 14.10.15	Six months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	713	152	865	1
68	" ..	H. McKenzie and Son ..	574	166	740	2
64	" ..	W. M. Bayles	554	143	697	3
69	" ..	E. MacBrown	573	120	693	4
79	" ..	Lysbeth Poultry Farm ..	541	151	692	5
78	" ..	H. Hanbury	556	131	687	6
66	" ..	E. A. Lawson	523	143	666	7
63	" ..	A. H. Padman	507	155	662	8
72	" ..	Mrs. E. Zimmermann ..	530	131	661	9
70	" ..	A. A. Sandland	503	149	652	10
62	" ..	Benwerren Egg Farm ..	463	160	623	11
61	" ..	Mrs. H. Stevenson ..	458	164	622	12
65	" ..	Thirkell and Smith ..	474	145	619	13
67	" ..	C. C. Dunn	453	142	595	14
71	" ..	Moritz Bros.	448	144	592	15
77	" ..	South Yan Yean Poultry Farm	359	150	509	16
73	" ..	C. L. Lindrea	353	150	503	17
74	" ..	J. H. Gill	347	117	464	18
75	" (5 birds)	Fulham Park	328	123	451	19
		Total	9,257	2,736	11,993	
		HEAVY BREEDS.				
		WET MASH.				
97	Black Orpingtons ..	Marville Poultry Farm ..	663	142	805	1
86	" ..	C. E. Graham	649	152	801	2
100	" (5 birds)	J. H. Wright	658	118	776	3
81	" ..	Mrs. T. W. Pearce ..	644	125	769	4
85	" ..	H. H. Pump	592	123	715	5
89	Rhode Island Reds	E. W. Hippe	562	131	693	6
88	Black Orpingtons ..	J. McAllan	570	120	690	7
90	" (5 birds)	Oaklands Poultry Farm ..	576	112	688	8
93	" ..	L. W. Barker	545	140	685	9
94	" (5 birds)	D. Fisher	567	96	663	10
99	" ..	L. McLean	529	115	644	11
87	" ..	W. C. Spencer	523	118	641	12
91	" ..	A. Greenhalgh	490	146	636	13
84	" ..	Cowan Bros.	483	131	614	14
92	" ..	J. Ogden	453	156	609	15
95	Silver Wyandottes ..	W. H. Forsyth	474	109	583	16
96	White Orpingtons ..	Stranks Bros.	430	80	510	17
83	Black Orpingtons ..	G. Mayberry	386	124	510	17
98	Faverolles ..	K. Courtenay	360	150	510	17
82	White Wyandottes	J. B. Brigden	232	110	342	20
		Total	10,386	2,498	12,884	

Report.

Weather conditions this month were again very changeable. North-west winds were very prevalent with a good deal of rain and some frosts. Temperatures ranged from 32° to 86° Fah. The lay for the month has averaged slightly better than 32 eggs per pen per week, which is probably a record for a like number of birds. The scores put up by some pens are very interesting at this date, being the end of the half-year. Pen 80 (dry mash), owned by Mr. W. H. Robbins, with 865 eggs, is seven ahead of the leading pen of the last competition at the same date, and the birds are looking hard and fit after their strenuous work. In the heavy breeds Marville Poultry Farm's pen, with

805, is sixteen eggs ahead of the leading score last year, and Mr. C. E. Graham's, with 801, is twelve ahead. In the wet mash Leghorns Mr. E. B. Harris leads Mr. G. McDonnell's pen by one egg. Mr. W. G. Swift's pen, although the birds are looking quite fit, has eased off temporarily. The pens of Messrs. Lawson, Bayles, Broadbent, West, McKenzie, and others are close up. The competition looks very open indeed, as a fast run by any of these pens may alter things materially. The health of the birds is all that could be desired. With the advent of warmer weather the birds can now enjoy a plentiful supply of freshly-cut lucerne and white clover. These legumes, supplying as they do a liberal nitrogenous content, in addition to their corrective qualities, are particularly useful, and effect a material saving in the feed bill in addition to their health-giving qualities. Rainfall for month, 217 points.

The eggs are this year being sold at 1d. a dozen over the top price quoted in the *Age* and *Argus*. The average price for the first six months' laying works out at 1s. 9½d. per dozen, and the yield from Mr. Robbins' pen is therefore £6 9s. 1¾d.—a return of just over 21s. 6d. a bird for six months, which again demonstrates the remunerative nature of the poultry industry.

The returns from the three leading pens in each section are as follows:—

LIGHT BREEDS.—WET MASH.

	Eggs Laid	Market Value.
E. B. Harris .. .	803	£5 19 10½
G. McDonnell .. .	802	5 19 9
W. G. Swift .	794	5 13 9½

LIGHT BREEDS.—DRY MASH.

	Eggs Laid	Market Value.
W. H. Robbins ..	865	£6 9 1¾
H. McKenzie and Son ..	740	5 7 11
W. M. Bayles	697	5 1 7¾

HEAVY BREEDS.—WET MASH.

	Eggs Laid	Market Value.
Maryville Poultry Farm .	805	£6 9 2[illegible]
C. E. Graham	801	5 19 7
S. H. Wright . ..	776	5 11 9

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

VICTORIAN RAINFALL.

Third Quarter, Year 1915.

A perusal of the table given below of the rainfall in Victoria will show that most of the State, in July, had falls exceeding the average, the chief exception being the Gippsland Division and the Volcanic Plains in the west. These rains, following on those of the previous good month, were of an extremely welcome character, accompanied, as they were, by warm temperatures and very few frosty nights. Thus conditions could hardly be better for the agriculturist. As three huge Antarctic depressions operated during the period, the distribution

extended over the greater portion of the month, with intervals of fine, bright sunshine, from the 15th to 18th, and again from 26th to 29th. August was a month of splendid rains, even more beneficial than its predecessor, in the fact that a greater area of the State had abundant rains: and even where the totals did not came up to averages, the departures were small. As temperatures were mostly mild, and the weather favorable, hopeful prospects were well maintained. The rains were again mainly due to the influence of Antarctic depressions, and some cold periods were experienced. Another prosperous month for the man on the land occurred in September, rains throughout being above the averages if the East Central, and a small part of East Gippsland be excepted. Temperatures were again extremely mild, and all the conditions that could be desired for the promotion of agricultural and pastoral industries were existent. Thus the winter rains were extremely beneficial, and highly satisfactory. Floods were experienced over the drainage areas of the Wimmera and Avoca Rivers, and, to a lesser extent, on the Glenelg.

Crops throughout are extremely healthy and strong, and growth in some cases phenomenal Abundance of pastures, more than sufficient for requirements, owing partly to the depletion in stock caused by the previous drought, but mainly through the extremely favorable rains, prevails throughout, and northern areas especially have benefited considerably. Stock are mostly in excellent condition, though in some parts of East Gippsland they are somewhat poor, but recovering condition consequent on the September rains, and the growth in grass experienced thereby.

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	126	96	261	483
	Normal	78	109	100	287
	Per cent. departure from normal	+62	−12	+161	+68
Mallee South	District Mean.. ..	142	184	310	636
	Normal	116	125	131	372
	Per cent. departure from normal	+44	+47	+137	+71
North Wimmera ..	District Mean.. ..	178	251	405	834
	Normal	157	170	165	492
	Per cent. departure from normal	+13	+48	+145	+70
South Wimmera ..	District Mean.. ..	185	323	472	980
	Normal	203	210	210	623
	Per cent. departure from normal	−9	+54	+125	+57
Lower Northern Country	*District Mean.. ..*	172	195	286	653
	Normal	142	158	141	441
	Per cent. departure from normal	+21	+23	+10[illegible]	+48

VICTORIAN RAINFALL—*continued.*

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Upper Northern Country	District Mean.. ..	211	267	345	823
	Normal	188	201	182	571
	Per cent. departure from normal	+12	+33	+90	+44
Lower North-East ..	District Mean.. ..	331	427	357	1,115
	Normal	282	249	255	786
	Per cent. departure from normal	+17	+71	+40	+42
Upper North-East ..	District Mean.. ..	400	700	604	1,704
	Normal	457	430	421	1,308
	Per cent. departure from normal	−12	+63	+43	+30
East Gippsland ..	District Mean.. ..	80	203	278	561
	Normal	239	208	275	722
	Per cent. departure from normal	−67	−2	+1	−22
West Gippsland ..	District Mean.. ..	126	377	332	835
	Normal	285	300	342	927
	Per cent. departure from normal	−56	+26	−3	−10
East Central	District Mean.. ..	191	361	289	841
	Normal	295	286	335	916
	Per cent. departure from normal	−35	+26	−14	−8
West Central	District Mean.. ..	163	186	258	607
	Normal	179	185	227	591
	Per cent. departure from normal	−9	+1	+14	+3
North Central ..	District Mean.. ..	273	367	407	1,047
	Normal	255	251	260	766
	Per cent. departure from normal	+7	+46	+57	+37
Volcanic Plains ..	District Mean ..	178	302	419	899
	Normal	236	241	281	758
	Per cent. departure from normal	−25	+25	+49	+19
West Coast	District Mean.. ..	322	438	486	1,246
	Normal	344	318	323	985
	Per cent. departure from normal	−6	+38	+50	+26

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Pests.

As a preventive against codlin moth the trees should be kept well sprayed with arsenate of lead. It has been definitely ascertained that this is the best remedy, and all other mixtures should be discarded in its favour. Its permanent qualities, combined with an effective killing strength, render this mixture invaluable; at the same time, it is easily mixed, and so very few brands leave any sediment that the work of spraying is now reduced to a minimum.

If the spraying is careful and thorough, no bandaging need be carried out. The time spent in bandaging would be better employed in an extra spraying The first spraying should be given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that, the grower must use his own judgment as to the necessity for subsequent spraying If the moths be at all prevalent other sprayings will be quickly necessary.

For the cherry slug arsenate of lead may be used, except where the cherries are approaching ripeness; hellebore, lime, or tobacco water should then be used.

The work of cultivation, ploughing and harrowing should be completed immediately. It is always advisable to have the ground well tilled before the dry weather sets in.

All crops for green manure should now be under cover; and if the orchard soil is at all heavy and sticky, the grower should make up his mind to grow a cover crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but to do away with all hiding places of the Rutherglen fly, cut-worm moths, &c.

General Work.

Grafted and newly planted trees should be frequently examined, and given an occasional watering and overhead spraying to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with a light grass or straw mulching, not too rich in animal manure.

The disbudding of unnecessary shoots, and the pinching back or stopping of growths, to prevent them from being unduly prolonged, may now be carried out. This work is particularly important on young trees. Graft ties should be examined, and the ties cut wherever any growth is being made. When the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, watering and mulching them after planting.

The Vegetable Garden.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, and pumpkin, and all seeds of this

family may now be sown in the open. Where these plants are already growing, the longest and strongest runners should be pinched back to throw the strength into the flowering and lateral growths. Watch these plants for mildew, and use sulphur freely wherever present, especially on young plants.

Peas, lettuce, radish, and turnips, cabbage and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it may be well to dip the whole plant in water before planting. This greatly assists the young plant while taking hold of the soil in its new location.

Frequent waterings and frequent cultivation will now be necessary, and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. The plots will then be ready for the celery, cabbage, and other seeds planted during the month.

Tomato plants will now require constant attention, watering, staking, and thinning, and pinching back of the laterals.

The Flower Garden.

Hoeing, surface cultivation, watering and mulching are the principal necessities for the flower garden this month. One hoeing is worth half-a-dozen waterings. Keeping the soil surface loose and providing an earth mulch for the plants, is far more beneficial, and far less weakening than excessive waterings, to which the garden plants are so frequently subjected in summer. It is safe to say that a greater number of plants are lost in summer through excessive waterings than through the absence of water. Further, the light sprinklings which are so frequently given in hot weather rarely reach the roots of the plant, and only serve to cake and harden the soil, resulting in a further loss of moisture by capillary attraction.

If not already planted out, all bedding and foliage plants should now be in their places in the garden—included amongst these are *begonias, salvias, alternantheras, iresines, &c.*—while annuals for autumn flowering should now be sown.

All bulbs, corms, and tubers that have ripened their foliage may be removed from the beds, after the foliage has died, and stored in a cool place till next season. Precautions should be taken against damp, which will cause the bulbs to decay.

Herbaceous plants, such as perennial phlox, delphiniums, campanula, as well as gladioli, will all be benefited considerably by liberal waterings of liquid manure, or by mulching with well rotted manure. Whenever necessary, these should all be staked.

Dahlias and chrysanthemums for early flowers should now be planted.

A New Rose Disease.

For some three or four years rosarians have been troubled with a die-back on the rose bushes. The leaves shrivel, turn black, and drop off, then the shoot dies right back to the main growth, this growth afterwards gradually dying as well. Until this year the disease has not been very prevalent, and it was thought, in the gardens where a few roses were attacked, that probably soil or manurial trouble was responsible for the disease. As, however, it assumed serious proportions this

season, the disease was brought under the notice of the Government Vegetable Pathologist, Mr. C. C. Brittlebank, who has determined the presence of an unknown bacteria in very large numbers. Not only has the bacteria been found in the diseased part, but wherever the plant has been punctured by the rose aphis, the bacteria are present in large numbers. It is not possible to give very much information regarding this trouble at present, as it is still being investigated; but, in view of the fact that rose-growers will shortly be considering the summer pruning of their roses, it is thought advisable to give one or two recommendations with a view to keeping the disease in check as much as possible. It may be spread by the aphis, and also through the medium of the secateurs, or any other pruning instrument. So that, in order to cope with the disease, the aphis-infected plants should be sprayed rather more than usual in order to eradicate the pest. Then the pruning implement should be dipped in a strong solution of formalin, especially where they have been used to prune any infected plants. The prunings should be burnt with as much speed as possible, and if these means are taken, the spread of this serious trouble for the present season will be minimized.

WAR LOSSES.

The press telegrams report the death of Leon Pellet, the noted French sugar scientist, whose works have been on the tongue of every progressive sugar manufacturer. Mr. Pellet was killed in action while serving with the French Army. When the war broke out he responded to the country's call, was promoted shortly to the rank of colour-sergeant, then to sergeant-major, and shortly before he was killed he was promoted to sub-lieutenant. Deceased was born in Paris in 1878, and received his scientific education at Lycee Michelet, near Paris, and was appointed chief of chemists to the Pont d'Ardres Sucerie. He was also connected with the Sociéte Generale des Suceries at Raffineries d'Egypte, where he acquired exceptional experiences in the manufacture of cane sugar. Subsequently he was engaged by Mr. Kestner, at Lille, where he added laurels to his researches. He was an indefatigable worker, had exceptional intellectual facilities to hound down any subject, and that with extraordinary ability, to co-ordinate facts and correlate them to the great fundamentals of sugar manufacture. The list of books and articles that were the output of his fertile brain is too long to mention, but they covered principally the chemical and engineering end of the sugar industry. His passing away is indicative of the pathetic feature of the war in Europe, for such men are particular gifts to the world that cannot be replaced like guns, cannon, or even lands and houses.—*The Louisiana Planter and Sugar Manufacturer.*

REMINDERS FOR DECEMBER.

Live Stock.

HORSES.—*Stabled Horses.*—Over-stimulating and fattening foods should be avoided. Give water at frequent intervals. Rub down on coming into the stables overheated. Supply a ration of greenstuff, if available, to all horses, or bran mash once a week with 3 or 4 packets of Epsom salts. *Brood Mares.*—Those with foals at foot should be well fed. *Early Foals* may, with advantage, be given oats to the extent of 1 lb. for each month of age daily. Examine the

region of the jaws, neck and forelegs for eggs or nits of bot-flies. If present destroy by running a singeing lamp lightly and rapidly over the affected regions.

CATTLE.—*Provide succulent fodder and plenty of clean water and shade.* Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron, ½ lb. Look out for milk fever. Read up method of treatment in *Year-Book of Agriculture, June,* 1905. Have cows tested for butter-fat and weighed. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read articles on breeding and feeding in *Journals* for April, 1912, June, 1913, and May, 1915. Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—*Mate all ewes procurable at as early a date as possible.* Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. If conditions justify it, 3 and 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring an increased number of twin lambs. Clear wool and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed or as near one cross as possible to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. Ewes carry their lambs, four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

Cultivation.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—*Keep the surface loose and free.* Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench) and carefully remove any scion roots. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain. *Look out for oidium and repeat sulphurings on first appearance of disease.*

Cellar.—Fill up regularly and keep cellars as cool as possible.

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIII. Part 12. 10th December, 1915.

LONGERENONG AGRICULTURAL COLLEGE.

FARMERS' FIELD DAY.

THE MINISTER OF AGRICULTURE EXPOUNDS THE WHEAT MARKETING SCHEME.

(Abridged from the *Wimmera Star*, 16th November, 1915.)

Longerenong Agricultural College was *en fête* last Saturday, when the second annual Farmers' Field Day was held in the wide demesne, under the auspices of the Horsham Agricultural Society. Upwards of 200 farmers from the Wimmera district, chaperoned by the students, visited the experimental field plots, prior to partaking of refreshments in the great hall, where speeches were delivered on the financing of the harvest by Mr. Hagelthorn and other members of the State Ministry.

Among the distinguished guests were the Hon. F. Hagelthorn, M.L.C. (Minister of Agriculture); Hon. W. L. Baillieu, M.L.C.; Mr. W. A. Adamson, M.L.C. (Minister of Public Works); Messrs. J. Gray, M.L.A.; R. Bloomfield Rees, M.L.C.; Sir John Forrest, P.C., G.C.M.G., M.H.R., Mr. A. S. Rodgers, M.H.R.; Mr. James Menzies, M.L.A.

The visitors were met at the entrance to the experimental fields by Mr. A. E. V. Richardson, M.A., B.Sc., Superintendent of Agriculture, and Mr. A. C. Drevermann, Principal of the College.

The grounds never could have been seen under better conditions, nor could the crops have presented a more luxurious appearance than on Saturday. Everything that tillage and scientific application of

fertilizers, combined with a good growing season, could accomplish was in full evidence.

In the course of an address to the assembled farmers, Mr. A. E. V. Richardson, Agricultural Superintendent, stated that the Experimental Plots conducted at Longerenong are being worked in co-operation and co-ordination with similar work, of a more extensive character, on the State Experiment Farms at Werribee and Rutherglen. Werribee is the Central Research Farm, on which is taken the initiative in all experimental work; Longerenong College is used as an experimental centre for the Wimmera district; and the Rutherglen farm as an experimental centre for the north-east. One of the most important features of Longerenong is that it is used as a centre for the production of new varieties of wheat that are likely to be of service under Wimmera and Mallee conditions. The experiments at Longerenong were all started three years ago. They were established in the interest of farmers to demonstrate under experimental conditions the results that would accrue from treating the soil in different ways, with different manures, and with different varieties of wheat.

Mr. Richardson pointed out that there were 400 varieties of wheat under observation, obtained from all parts of Australia, Canada, United States, Russia, and even from our hated enemy, Germany. While the majority of these wheats are unsuitable for our climatic conditions, they are of considerable indirect value in improving by cross-breeding our local varieties. Several of the crosses promise to excel the common staple varieties in prolificacy at the present time. Some are prolific, but prone to rust; some rust-proof, but poor yielders. The aim of the Department at Longerenong is to produce heavy-yielding varieties that are relatively immune from fungoid pests, and this Mr. Richardson is not hopeless of obtaining. Some of his crosses already are remarkable for their encouraging promise. Federation appears to be the present standard of comparison, and was to be seen planted at every tenth row. The popularity of Federation with our farmers may be gauged from the fact that out of the 20,000 bags of seed wheat bought by the Government on the Minyip Station last year, 19,000 bags were found to consist of the Federation variety.

The main subdivisions of the work were the variety wheat tests, fertilizer trials, selected wheat plots, forage trials, and plots for the production of new crossbred wheats.

In the variety wheat section a number of new crossbred wheats were undergoing trial in competition with well known standard varieties, such as Federation, Yandilla King, and Dart's. Great interest was evidenced in a new crossbred wheat, namely, Indian F. x Federation, which stood out prominently from other crops by the extraordinary length and compactness of the heads. This plot gave promise of yielding several bushels more per acre than the best standard varieties.

In the fertilizer trials, fifteen different combinations of manures were being tested. These plots demonstrated the superiority of superphosphate over other phosphatic dressings. Some plots were treated with superphosphates at rates varying from 56 lbs. to 2 cwt. per acre; it was noticeable that the heavier dressing of phosphate gave a much more marked response than the lighter dressings. Other features of interest were the effect of lime in combination with superphosphate.

The application of lime in small quantities seemed to result in a decided improvement in the yield. Only when these plots are harvested will the full value of these differential applications of manures be apparent, and the net profit accruing from each application known.

In the forage section, attention was directed to the remarkable growth of dun peas. These were very heavily podded, and, besides being of considerable grazing value, would greatly ameliorate the fertility of the soil. An extraordinary heavy crop of rape was observed, 4 feet high.

A whole block was devoted to testing new crossbred varieties that had been evolved during the last four years. A number of these showed considerable promise. Among the outstanding types were the crosses of Indian F. x Federation and Bobs x Federation.

Other features of interest were the plots devoted to the testing of selected varieties of barley. Two years ago yields ranged from 60 to 80 bushels to the acre. These were secured from Oregon, Cape, and Squarehead barleys. Plots this year gave promise of almost equally heavy returns. Among the varieties tested are Cape, Oregon, Squarehead, Shorthead, Pryor, Goldthorpe, Kinver, Golden Grain. Other tests of interest were the graded seed trials and rate of seeding tests. Federation seed at the rate of 30, 45, 60, 75, 90, and 120 lbs. per acre was sown in May and July, with the object of testing which is the most profitable rate of sowing per acre, when seeding is early or late respectively. Tests were also made to compare the relative value of seed from the harvester with first, second, and third grade seed from the grading machine. A series of half-acre plots, the produce of the selection plots of the previous season, were tested, with the object of providing bulk seed for the farm plots. The varieties under trial were Federation, Currawa, Major, College Eclipse, Viking, Bunyip, King's Early, and Hudson Purple Straw.

A demonstration of the cross-breeding was given by Mr. Richardson in the grounds. He showed how Indian F. was crossed on Federation. This was illustrated by blackboard diagrams, and by handing around dissected parts of the wheat flower.

He stated that the production of new varieties by cross-breeding was governed by laws, which were now well known. Specimen heads were gathered from the plots to show how various important characters in wheat, *e.g.*, shape and structure of the ear, were inherited in the first, second, and third year, and how a knowledge of the laws of inheritance enabled the breeder to rapidly fix new and desirable characters in wheat, and how to combine the qualities of two or more types of wheat into the one variety.

When the exceedingly interesting address of Mr. Richardson at the blackboard had concluded, a profitable hour was spent with him as guide wandering through the wheat and forage plots. When all that was possible to see within the limited time had been examined, the party entered their waiting motors and buggies and drove up to the hall, where the tables were laid, and students waited in attendance. Tea and comestibles having been disposed of, the more serious matter of speech-making started, and the attentive visitors listened with rapt attention to modes, methods, ways, and means of handling their wheat.

THE SPEECHES.

The Hon. F. Hagelthorn, M.L.C., Minister of Agriculture, after a few introductory remarks, said the question of marketing the Victorian harvest by the Government is one in which every one is interested. Farmers want to know how they are going to market their wheat, and how they are going to be paid for it. Some two or three months ago, in order to secure some unanimity of action, it was decided by the Victorian Government that a conference of Ministers of the four wheat-growing States should be called. I was asked by Mr. Hutchinson, the then Minister of Agriculture, to be present, and assist him, as far as possible, to evolve a scheme that would be satisfactory to the people of Victoria and the wheat producers of the four States. A number of schemes have been promulgated. My colleague, Mr. Rees, has submitted one, and is to be congratulated upon the keen insight he has taken in that which affects the financial province of the harvesting. (Hear, hear.) All these schemes were pondered over before going to the State Conference, but they seemed to fall far short of meeting the difficulty of satisfactorily marketing the crops. In our trouble we turned to a gentleman who has solved many difficulties, Mr. Baillieu. It is perhaps difficult to pick out what part of the scheme is his and what part is mine, and what part is due to the other Ministers who were on the conference. It is certainly difficult to apportion the proper share of the merit to each; but whatever he or I conceived, we came to the conclusion that a common scheme was necessary, and that having undertaken to do part of the work in harvesting the crop that the Government was compelled to "go the whole hog," and do it all. Mr. Baillieu, after conference with some of his colleagues, evolved a skeleton scheme, which was submitted to the conference, and practically adopted. Mr. Rees' scheme embraced the issue of negotiable scrip. The Government of New South Wales was prepared to make an advance of 2s. a bushel f.o.b., and South Australia had a somewhat similar scheme. New South Wales, under its scheme, would have had to appoint quite an army of men to take control of the wheat storage and enter into competition with existing organizations which had dealt with the storage of it in the past. The conditions were regarded as impossible, and the New South Wales scheme was withdrawn. South Australia proposed to advance 2s. a bushel on wheat stored by certain recognised private firms. The weakness of this proposition was that a farmer whose wheat was so stored would generally be left with his produce on his hands, as compared with the farmer who had not received a Government advance. The merchant would obviously ship away the wheat on which he had advanced his own money, and thus the unfortunate Government-aided farmer would always be left to the last, to take whatever low prices might be going at the time. Those farmers who received no Government advance would derive all the benefit from the pick of the markets, and the State Government would be blamed because its clients would be the worse off. A number of modifications of this scheme were suggested, and submitted to the conference, but they all came back, with the objection that we were short of shipping facilities; and, in order to deal fairly, it would be necessary to provide that each man should have an equal chance of getting his wheat away to obtain a fair price for it.

If certain merchants were allowed to get possession of ships, they would be able to deliver and sell at high prices, while those who could not get vessels would have to sell their wheat at absolutely wreck prices. It had been suggested that the Government should let things go on in the ordinary way, or provide the ships, and allow the merchant to do the rest. Well, Mr. Hughes, one of the keenest critics I ever met, thought it necessary to prevent any one merchant from receiving a higher bonus than another by giving him any particular ship, and, secondly, that the matter should be dealt with so that all wheat producers should obtain an average price. We then arrived at the present scheme, in which the principle is recognised that it is absolutely essential, in the interest of the farmers and the people, that all persons should get an equal opportunity to dispose of their wheat. If we were going to have things effectively done it was also essential that all the States should adopt the same policy. The Victorian Government will take complete control of all wheat grown within the State, and will truck to the seaboard, ship, and sell all wheat that leaves the country; and be the only sellers of wheat used for internal consumption. There will be only one source—the Government—from which millers will be able to obtain wheat. We expect to have 150,000,000 bushels of wheat, which at 4s. a bushel represents £30,000,000. Victoria will have at least one-third of that total, and we expect £12,000,000 for our wheat. It is a great sum of money, and one that few Government Departments have ever been called upon to handle; and if we had not taken the matter in hand the farmer would be compelled to sell his wheat at wreck prices; because in these abnormal times there will be a scarcity of shipping, and the wheat would be left on his hands, and he would have to struggle to realize at any price to meet his obligations. After consultation with Mr. Hughes, I made inquiry from the big merchants, and found that they had authority to sell at 3s. 6d. a bushel on the rails, and at Williamstown, at a time when the London parity was 4s. 6d. a bushel; so that we would have had to take a shilling below the value at that time. Under such conditions, of what use would be the wheat certificates proposed by Mr. Rees; they would prove "mere scraps of paper." Without assured means of shipment, who would buy? And without buyers, where would the farmer be? Had the few ships available been allotted to a few merchants these men would have made enormous fortunes at the expense of the community. We took pains to have the position proved. We asked the merchants, who are in the habit of buying wheat in normal years, if they would buy wheat from week to week and month to month. They, one and all, said, "We will not buy a single bushel of wheat more than we have bottoms to fill, and we must have these ships allotted to us." That means, we said to them, that except for the wheat sent away in these ships, wreck prices will have to be accepted. They answered, "No, because as there will be no buyers, there will be no sellers." But it is obvious that many farmers would have had to force wheat upon the market at a sacrifice in order to pay their back debts and keep going. Another difficulty which confronted us was that of getting any ships at all. The Admiralty was taking over all the spare ships possible, and had begun to cast eyes on Australian traders. Mr. Hughes, hearing that fourteen of our steam-ships would be required for transport of troops, cabled to the Admiralty, "We don't want to interfere with your

work, but we want you to understand that unless Australia can finance its wheat harvest it will have great difficulty in financing its part in this great war." The Admiralty replied by releasing the fourteen vessels, and promising to provide as many ships as could be spared to take away our wheat. To talk about private enterprise being able to do better than we can, assisted by the British Government, is to talk nonsense! There may be some who will say they do not want to be interfered with, and may want to hold over their wheat. If a number of men thought that way, it might be very difficult to get ships at all when they might want to ship away their wheat. In the common interest we want to see that wheat is shipped away as regularly as possible, and it may be necessary to take legal powers to take control of wheat within the State, in order that every one interested may get a fair and equitable price all round. Our proposition is to make an advance of 3s. a bushel f.o.b., and it will be gratifying for you to know that the present f.o.b. price of Australian wheat is 4s. 9d. per bushel. We feel that we run but little risk in making that advance of 3s., and the farmer will get the full residuum of what we realize. Should the wheat realize 4s. 9d. a bushel, there will be a dividend of 1s. 9d. payable on each bushel of wheat. This proposition is not the creation of a Socialistic Government, but of Mr. Baillieu and myself, two members of the Victorian Government. My interest is entirely the same as that of the farmers of this State, and Mr. Baillieu has great interest in wheat in the North Province, on the east side of me. Our interest is that of the farmers, and the interest of the farmers is that of the community. As I said, we have 150,000,000 bushels of wheat; and the bankers did not like this proposition of ours. They objected to it as Socialistic. We requested them to give us an alternative proposal. They could not, and did not. The alternative scheme would have resulted in our wheat fetching 1s. 6d., or some such ridiculous price. The scheme was submitted to the conference of the Prime Minister and the various Ministers of Agriculture which sat in Melbourne. When first introduced it had not a single supporter. It was regarded as a huge, unwieldy scheme, which could not be worked, and as a Socialistic enterprise none of them dare enter upon; and all, including the Prime Minister, than whom there is no keener critic in Australia, refused to touch it until the last day of the conference, when the soundness of the proposal was recognised. This present Liberal Government of Victoria is entirely responsible for the proposal. Eventually the Associated Banks recognised it to be the only practical scheme, and we not only gained their approval, but unanimous agreement to find the money to pay this advance of 3s. a bushel. From beginning to end this scheme has been considered and criticized by the ablest business men, and indorsed by them as the only scheme that will obtain for Australia the highest price for its harvest exported over the seas. The millers, too, would probably admit that they would give something less than f.o.b. prices if there should be a glut in the market, as probably no one is so patriotic as to give farmers more than they are obliged for their wheat.

Mr. Noske.—The banks would not allow us to. (Laughter.)

Mr. Hageltborn.—Perhaps Mr. Noske would give a shilling more a bushel, but in competition with other less patriotic millers he would not

last long. (Laughter.) We propose that the millers shall not be allowed to buy wheat except through the Government, and the price fixed will be the London parity f.o.b. The farmers under our scheme will not only get full parity price for 30,000,000 bushels of wheat shipped out of the country, but for 10,000,000 bushels used in our internal trade. Our keenest critics acknowledge that it is the only possible scheme. No doubt some men who have been accustomed to handle our harvests as brokers and buyers will squeal at being dispossessed of their profit-mongering until the public are almost persuaded to think there must be something wrong. We want to interfere as little as possible with the ordinary agencies which have handled our wheat in the past, but we cannot have 400 agencies. Still, while our agencies must be limited, we will ask those agents who are appointed by the Government to give every consideration to those who have until recently been earning their money by handling wheat. I happen at this time to control the destinies of Victorian agriculture, and will be largely responsible for carrying out this great Socialistic scheme. There is a great possibility of wrecking my reputation, and I sincerely trust that, unless you find serious mistakes, you will give as much help as possible, relying upon all the intelligence, ability, and honesty that I possess being given to the discharge of my duties and the *bonâ fide* interests of the community. It must be gratifying for you to be told that Mr. J. Weldon Power has had the advantage of looking critically into this scheme, which meets with his hearty and unqualified approval. (Loud applause.)

The Hon. W. L. Baillieu, M.L.C., did not expect the audience to signify their unanimous approval of the scheme as a whole. Men who regard themselves as very keen, when first the proposal was placed before them, shook their wise heads, and said it bordered on Socialism. They were asked to suggest something else, but could not, and he (the speaker) knew of no other scheme that would give equality of opportunity to all producers. We could not expect to market all the wheat this coming season, therefore the strong hand of Government must intervene; otherwise some farmers would sell all their wheat, and others be able to dispose of none. There may be mistakes made, and being made by the Government, they will be known to the world. Private enterprise is guilty of mistakes sometimes, but hushes them up. He had no time for the man who only wanted advice from particular men of a particular cast of thought. We had been very lucky at such a crisis as the present in having such a strong man as Mr. Hughes at the head of affairs. Everything was abnormal these days except our natural disposition to go down on our knees and thank God for our possession of the British Navy. (Cheers.) We were engaged in a struggle for the right to live. He knew there was a good deal of lip service, and many people had said they did not want to make anything this year. Well, he would give them an opportunity to show the genuineness of their meaning. (Applause.)

Mr. Noske stated that the millers had held a meeting, and heartily concurred with the action of the Government, and were pleased to have Mr. Hagelthorn at the head of affairs. Mr. Hagelthorn had estimated the value of wheat at 4s. 9d., but he regarded that as a mistake, because the Government of New South Wales had sold wheat at 56s. a quarter, which would be equivalent to 4s. 3d. in Melbourne yesterday.

Mr. Hagelthorn said the last quotation received by him from London showed 60s. 9d. a quarter, or about 7s. 6d. a bushel. Expenses might fairly be put down at 2s. 9d., leaving 4s. 9d. f.o.b.

Mr. A. S. Rodgers, M.H.R., said he was not in favour of Socialistic schemes, preferring private enterprise. This scheme of Messrs. Hagelthorn and Baillieu would see the farmers through, and insure them full prices for their wheat. It was a bold, big scheme, on the successful carrying out of which the political life of themselves and their Government depended. He had examined every phase of this harvesting problem, and knew of no alternative. From the day that the wheat is parted with until it is sold in London it belongs to the farmer; and all the time it is travelling to London the added weight is accruing to the farmers' credit also. (Hear, hear.) As he had before stated, he had no claim to the origin of the scheme, but he thought it the only scheme that will render the farmer the full value of his two years' labour. He would ask, before sitting down, that Sir John Forrest, whom he had induced to come up and see the bloom and fertility of the Horsham district, should be accorded three hearty Wimmera cheers. The request was vociferously complied with.

Sir John Forrest, M.H.R., P.C., G.C.M.G., spoke of the pleasure his visit had afforded him, and the great impression which the marvellous fertility of the country had made upon his mind. In all his travels he never remembered seeing a better wheat growing district than the Wimmera, or such wheat crops. He expressed the opinion that agricultural research must inevitably react on the farming community, and result in improvement; and he took the view that experimental plots such as he had witnessed that day must be of great value, and he was glad of having been afforded an opportunity of inspecting them. We were not living in ordinary times. If they were ordinary times, this Government wheat-buying scheme would not have been undertaken, but if we remembered that our restricted markets are only kept open and only possible because of our great Navy, as Mr. Baillieu had happily said, we would indeed go down on our knees to thank God for it. (Applause.)

Mr. J. Weldon Power, before parting, referred to the great work that had been accomplished by Mr. A. E. V. Richardson, Superintendent of Agriculture. He could assure Mr. Richardson that he was very highly thought of by the people of the Wimmera, and those who knew him personally felt a very great affection for him.

Mr. R. B. Rees, M.L.C., referred to the wheat scheme, compared with which his own was merely a baby, and he hoped that it would be greeted and attended with the success it deserved.

Mr. James Menzies, M.L.A., joined in favour of the proposed scheme, which was a great departure, but necessitated by the times. He referred to the good work done by Mr. Richardson in the interest of wheatgrowers, both of the Wimmera and South Australia, in which latter place were still to be seen evidences of his influence among the farmers. As to Mr. A. C. Drevermann, the Principal of the Longerenong College, he had earned the confidence and affection of the students, and there was not wanting evidence, inside and outside of the institution, that it was being conducted on sound lines, and he trusted that the students

would, in coming years, set the standard, not only in Victoria, but throughout Australia.

Mr. Thomas Young gave an amusing experience of his visit to Melbourne, when some of the financial heads held the opinion that the wheat should be left to finance itself, the same as the wool; but he did not agree with them, and thought he would vote for the Referendum if it would have the effect of making the banks find the money. He considered no better scheme could have been brought forward.

Mr. Walter Rule, President of the Horsham Agricultural Society, feared that, in spite of all schemes, the farmers' Judgment Day would come round just as usual on 4th March, when they would have to meet everything they had signed the previous year. Would the 3s. advance meet the demands against 50 per cent. of the farmers on that date?

Mr. J. Weldon Power said that was not the point. Mr. Rule was mistaking the point for the worry. The point was what would have been the position had we not got 3s. from the Government? The occasion had not been originated by the propounders of the scheme. The propounders had been aroused by the occasion, and it was the only practical scheme by which the farmer could obtain salvation.

A vote of thanks to Mr. J. Weldon Power for presiding brought a very enjoyable afternoon to a close.

FINANCING THE HARVEST.

A Comprehensive Scheme.

[This article appeared in the *Age* of 9th November, 1915.—EDITOR.]

The anxiously awaited official announcement regarding the arrangements made by the Federal and State Governments for the sale and transport of the exportable wheat surplus was made by the Prime Minister (Mr. Hughes) yesterday.

"The news that the conference of Commonwealth and State representatives has agreed upon a comprehensive scheme for financing, storing, selling, and transporting this season's wheat to the oversea markets," said Mr. Hughes, "will be received with very great satisfaction all over Australia. To the producers and others directly interested it will remove a load of anxiety and the growing fear, justified by the circumstances, that much of the new wheat crop could not be marketed, and that in consequence the benefits of the bounteous harvest would be lost. The presage of this disaster, coming on the heels of last year's drought, which brought ruin to some and plunged thousands into debt, filled the minds of the farmers with gloomy forebodings. And satisfaction that a workable scheme has been devised is not confined to the man on the land, but will be felt throughout financial and commercial circles. Every thinking man realizes what failure to market our products at reasonable prices means. The position was, and is, one that needs to be driven home to every citizen. As a community, we live on what we produce;

largely we live on what we sell overseas. Last year we suffered from a drought, and so had little to sell, and are many millions to the bad in consequence. This year, although we have not our normal quantity of wool to sell, we have very much more wheat than we ever had before; and prices of wool and wheat are high. Yet, unless we can find means to transport our produce to the overseas markets, these high prices are only glittering baubles, which mock our plight, but cannot help us in any way. It was to the solution of this problem that the wheat conference of the Commonwealth and States directed its efforts. It accepted without question that the successful marketing of our products was absolutely vital to our national, as well as industrial, welfare. The financial burdens imposed by the war are already very heavy, and are daily growing heavier.

We must sell our products. That is essential. There is no difficulty in finding buyers. The world is clamoring for wheat—the difficulty is to carry the wheat to those who want it. Scarcity of freight is the trouble. Some 25 per cent. of the world's tonnage is either locked up in enemy ports or at the bottom of the sea. Another 20 per cent. has been requisitioned by the Admiralty for transport and war purposes. The British Admiralty, so we are informed, has 800 steamers—not including trawlers—and is requisitioning more every day. The enemy's submarine campaign, although it has suffered a severe check, it still to be reckoned with. Here then is the position: With a greater harvest than we ever have had, calling for nearly twice the tonnage normally required, we find ourselves set an almost impossible task if we are asked to transport our surplus wheat to the oversea markets by the end of June next. By supplementing the freight chartered and to be chartered with the Commonwealth Fleet (of requisitioned and interned enemy steamers) we entertain no doubt whatever that we can carry all the new surplus wheat crop to market, but we do not anticipate being able to do this in the first six months of next year. This, of course, is most satisfactory as far as it goes, and it may be said at once that without the aid of the Commonwealth Fleet and the co-operation of the British Admiralty any attempt to transport our new crop would be hopeless.

But the problem is only half solved. What is the position of the farmer who, with wheat to sell, upon the sale of which he is in fact depending to pay his way, who cannot sell for six or nine months? For it is certain that the wheat-buying firms would only buy wheat to the extent covered by the freight actually allotted to them, and they would not buy any more until they were allotted more freight and had sold the wheat they had bought. Let us see what that would mean to the farmer. In December, January, and February, 1913-14, 615,000 tons were exported. Assuming that we are able to obtain an equal amount of freight during December and the first two months of 1916—we hope to do that, and even more—less than one-half of the estimated amount of wheat available for shipment during that period would be provided for—the remainder would be unable to find transport, and so could not be sold. And this difficulty would continue during subsequent months. And other contingencies may arise which would intensify the difficulties of this situation.

We must not forget that the Empire is at war, fighting for her very existence, and every arrangement for transport is contingent upon the exigencies of war. All freight is now subject to requisition for war

purposes, and, therefore, there is absolutely no guarantee that ships chartered for the purpose of conveying our wheat or those of the Commonwealth Fleet may not be taken by the Admiralty for war purposes. This being so, if we are to avoid disaster, allay uneasiness amongst producers which may lead to them rushing their wheat upon a local market, which could not possibly absorb it, and so bringing about disaster, arrangements to finance the farmer and to enable him to get as far as possible the advantage of the present high prices must be made. This the Conference has done. The scheme, which as I have already said, covers every phase of the matter, is practicable, and has enlisted the support of the interests necessary to insure its success

Wheat Buyers Co-operating.

The wheat-buying firms and flour millers have unanimously approved it, and agreed to work under it. It has been submitted to and approved by some of the ablest business and financial men outside of the shipping and wheat interest.

Shortly stated, the scheme is as follows:—The Commonwealth and the respective State Governments to control the receiving, financing, shipping, and marketing of the whole of the wheat crop of the wheat exporting States in excess of seed and feed requirements.

Methods of Control: The internal State organization to carry out the responsibilities as outlined in the preceding paragraph, to be arranged by the respective State Governments co-operating with the interest concerned. A London board, representing Commonwealth and States, is to be appointed, which is to have the co-operation of the London representatives of the principal Australian wheat buying firms. Government agents are to be appointed to receive wheat on behalf of their respective Governments.

Agents' Duties. The Government agents to receive the wheat at various centres, to issue certificates, to store and safeguard it, to consign it to various shipping ports, to ship it, and throughout from reception of shipment to be responsible for the weight, quality, and condition of the wheat. On receipt of the wheat the Government agent to issue a storage certificate showing quality and quantity of wheat delivered. Certificates only to be issued by firm's chief office in State. Quality to be stated in certificate. If inferior, value to be marked.

Advances to Farmers: Arrangements to be made for part payment to holders of certificates on the basis of 3s. per bushel f.o.b. at principal ports of shipment. The difference between the amount thus received and the average price received for all the wheat exported from the States less expenses, including interest, to be paid to the holders of certificates at the close of the season.

London Board: The selling to be intrusted to a London board. Selling commission and charges to be paid at the rate fixed. The returns from sales of each cargo to be credited to the exporting States Deliveries of wheat under this scheme to cease on 30th September, 1916, and accounts to be paid up, and final payments to farmers to be made subsequent to sale of the last shipment, probably not later than 30th November. As soon as possible after the sale of the last cargoes the Minister to ascertain the net average price realized for the whole of the

wheat shipped by his State, and each farmer to be credited with this rate on the whole of the amount delivered to the Government agent. Provision is to be made for supplying millers with wheat sufficient for their requirements at a price to be approximately the London parity.

The control of the whole scheme is to be vested in a committee representing the Commonwealth and States, with an advisory board of experts.

These are the main principles of the scheme, which, I venture to believe, will commend itself to the producers and to the community in general. It has behind it the resources of the Commonwealth and the States. It is practicable. All the wheat buyers and millers are co-operating under it. They are satisfied it is a workable scheme, and are determined to make it a success. Under it every farmer will get a fair deal; and there will be no scramble; every producer who desires it will *get an advance without waiting for his wheat to be shipped. And he will get at the end of the season every penny of the difference between that advance and the average price realized for the wheat exported from his State less expenses.* The arrangement covers all sales of the new season's crop, and I, representing the Commonwealth as well as the responsible Ministers of the respective States, appeal with confidence to all concerned to lend it their hearty support."

HORSES ATTACKING GREY-BOX TREES (EUCALYPTUS).

By P. Rankin Scott, Chemist for Agriculture.

A practice fairly common among horses grazing in paddocks containing grey-box trees is for the animal to attack the bark of these trees, presumably in search of some element of material benefit to its sustenance.

These attacks generally follow dry spells, when the paddocks are either comparatively bare of herbage, or the herbage is dry and of inferior quality.

Added interest is attached to this practice, as the animal may be observed to strip off and discard the dry outer layer or epidermis of the bark; it then proceeds to gnaw the more succulent inner cambium layer until it has removed all the bark within its reach. The action of the animal on these trees is a source of annoyance to the stock-owner, as the grey-box tree is not only ornamental, but it possesses practical utility in affording a good shade for stock, besides providing timber for many purposes.

To save the tree against such attacks remedial action is necessary; painting the trunk of the tree with a mixture of grease and Stockholm tar has been found effective. Specimens of the bark having been obtained from a stock-owner in the Goulburn Valley, who has had

experience of this habit of his horses, an analysis of the material was made, and gave the following results:—

Ordinary Fodder Analysis of Edible Portion.

Moisture	41.66 per cent.
Ash	8.02 ,,
Protein	1.12 ,,
Crude fibre	18.87 ,,
Nitrogen free extract . ..	30.00 ,,
Ether extract	0.33 ,,

Water Soluble Extract.

Volatile matter .. .	7.43 per cent.
Mineral matter	0.71 ,,

Composition of Ash.

Iron and alumina oxides	0.85 per cent.
Calcium oxides	53.78 ,,
Magnesium oxides	5.03 ,,
Potassium oxides	4.92 ,,
Phosphoric anhydride	1.18 ,,
Sulphuric anhydride	0.76 ,,
Silica	0.40 ,,
Undetermined, principally CO_2 .	37.08 ,,

The feeding value of the bark exhibits no abnormal quality that would account for the partiality displayed by the animals. The ash content, however, merits some consideration, as it shows an abnormally high content of lime. This material is not only a component part of the ash of all fodder plants, but varies considerably in different plants. It is worthy of observation in connexion with the mineral content of plants that while the general character remains fairly constant, the various ingredients composing the ash are subject to fluctuations, being governed by such conditions as fertility of the soil, moisture, heat, rapidity of growth, and stage of maturity. The lime content in the ash of wheat, oats, Australian grasses, lucerne, and clover are contrasted hereunder with grey-box-bark:—

Lime in Ash.

Wheat (grain)	3.47 per cent.
Wheat (straw)	5.35 ,,
Oats (grain)	3.30 ,,
Oats (straw)	5.75 ,,
Lucerne	31.40 ,,
Clover	34.90 ,,
Native grasses	2.70 ,,
Kangaroo grass	6.78 ,,
Edible portion of grey-box bark ..	53.78 ,,

Compared with the average content of native grasses, the lime content of the bark is marked. The probability is that the animal was drawn to feed on the bark in order to supplement a scarcity of lime in its diet. The liking displayed by the animal for the bark apparently indicates that more nutritious pasture was desired, either one containing a fair percentage of leguminous plants, or that the ordinary pasture should be improved by a dressing of bone dust to increase its mineral content. For immediate benefit to animals inclined to this practice, lime may be supplied in the form of a lick—composed of the following ingredients:—6 lbs. superphosphate; 6 lbs. slaked lime; and 5 or 6 lbs. of common salt.

A suitable position for the lick may be made by scooping out the top of an old tree stump and placing in the cavity so formed.

PROFITABLE POTATO PRODUCTION.

By J. T. Ramsay, Potato Expert.

An interesting illustration of the increased yield resulting from the proper storage of seed potatoes is furnished by the experience of Mr. J. G. Outhwaite, of Stony Creek, during the past season Portion of the seed saved from a crop of the "Up to Date" variety was boxed, *i.e.*, was stored in seed potato boxes from May, 1914, until December, 1914. Another portion of the seed from the same crop was stored from May to November in bags. In November, when the seed stored in bags was planted, it was found that nearly all the tubers had sprouted from every eye. Those tubers which were considered too large to be planted whole were cut for the most part into two sections. In December, when the seed which had been stored in boxes was planted, the potatoes were planted whole, as the majority of them sprouted only from the main eye. The manure used with each lot of seed was the same, viz., 2 cwt. of super-

phosphate per acre. The soil in which they were planted was apparently of the same quality throughout, and the preparation and inter-cultivation given to both lots were also the same. Owing to the fact that the boxed seed was not cut more weight per acre of these was planted. The rates of seeding per acre were:—Boxed seed, 1 ton per acre; bagged seed, 16 cwt. per acre. Although the boxed seed was planted about one month later than the other both lots matured at the same time, and when dug yielded the following weights:—Boxed seed, 13 tons per acre; bagged seed, 8½ tons per acre. These were sold at £5 per ton on rails, and a simple calculation shows that the boxed seed returned fully £20 per acre more than that portion of the seed which was not boxed. The best proof of the economic soundness of any system which is practised commercially is a practical demonstration of the enhanced profit accruing from its adoption. The boxing of seed potatoes, and the digging of potatoes for seed when immature, are continually advocated by this Department, and the example cited is a weighty proof of the profit to be gained from such practice.

LINSEED PRODUCTION.

By Temple A. J. Smith, Chief Field Officer.

At a time like the present, when it behoves the State to extend its small industries as much as possible, attention may well be directed to that part of the Report of the Inter-State Commission, just issued, which deals with linseed oil. It is published hereunder in the hope that the subject may attract the notice of agriculturists in those parts of this State as are suitable for flax culture—

LINSEED OIL. (TARIFF ITEM 234 (I).)

"There is but one manufacturer in the Commonwealth. The factory is situated at Parramatta.

This manufacturer first applied that the duty on raw linseed oil might be increased from 6d. to 9d. per gallon, and on boiled or refined linseed oil from 6d. to 1s. per gallon; but his application was afterwards replaced by another opposing reduction of duty. He stated that his company produced one-fourth of the total Australian consumption, its output being valued at £60,464 in 1913. In the same year the imports were £192,629. The Australian production was really only about one-seventh of the total consumption, the figures quoted by the witness as his output being based on his selling price compared with the f.o.b. price plus 10 per cent. of the imported oil. The duty of 6d. per gallon is equivalent to an *ad valorem* duty of 25 per cent., apart from the natural protection of freight, &c., which is stated as being a further 4d. per gallon. The seed is imported mostly from India. Practically no linseed is grown in Australia, though a bounty of 10 per cent. on the market price is offered for its production, the bounty being equal to about 25s. per ton of seed; the employment afforded in the oil business by the Tariff assistance is merely that engaged in handling the seed, squeezing it by hydraulic presses, and packing the resultant oil in drums. There is also the secondary operation of boiling carried on in respect of portion of the output, and indirect employment is afforded to some extent in making oil drums a manufacturer of which has applied for further protection (see *Report on Oil Drums*—Miscellaneous Group III.).

Duty was paid on 1,443,080 gallons of linseed oil in 1913, representing an amount of £36,077 in duty; but including the extra cost of the local oil by reason of the duty of the extra charge to the paint and other trades by reason of the duty would total about £40,000. It was asserted in evidence by the manufacturer that in his factory 26 men were employed, including packers and engine-drivers, and in addition ten youths and four boys, so that the industry has cost £1,000 per annum for each man, youth, and boy employed. The local maker further stated that he expected, with the present duty of 6d. per gallon, to double his output within twelve months. Since then the factory was burnt down, but has been re-erected, and the output largely increased.

Linseed oil is a most important item controlling the manufacture and cost of paints, putty, &c. There is considerable truth in the statement made that 'the price of paint is the price of oil.' As it is the principal ingredient, with white lead and other bases, in the manufacture and application of paint, it is plain that, if high duties are imposed on linseed oil in order to press it from imported seed, all paints and other manufactures in which it is necessary must be protected to an extent which may be deemed abnormal, and which will not only injure the general painting trade but be detrimental to the public interest. A reference to the influence of this factor on the manufacture of putty is given on page 20 of this Report.

A duty of 6d. per gallon simply to encourage pressing out the oil is not justified from an employment point of view as will be seen from a previous paragraph. The only *raison d'être* of such a duty is the encouragement of cultivation of the seed in Australia.

For the purpose of encouraging the local production of flax and linseed, a bounty was granted in the year 1907, payable until 30th June, 1917, of 10 per cent.

on the market value of flax fibre and linseed produced. The payments of bounty so far have been—

	Flax and Hemp.	Linseed (Flax Seed).
	£	£
1907-8	..	..
1908-9	126	6
1909-10	120	...
1910-11	123	...
1911-12	480	..
1912-13	215	9
1913-14	318	.

To entitle a producer to claim bounty on linseed the seed must be delivered to an oil factory for the manufacture of oil.

It is generally understood that the grower of flax must elect whether he will produce flax fibre or flax seed. He cannot grow both successfully on the one plant. On the other hand, if the fibre is desired, he must sacrifice the seed, and encourage the fibre growth; on the other hand, if it is the seed which is desired, then the cultivation must be specially diverted to attain that end. If the grower cultivates for both fibre and seed, the seed is of a comparatively low value. The figures given above would seem to indicate that, so far, it is found more profitable to grow for fibre, although that, as yet, is a very small industry.

In addition to the oil manufacture, the crushing of the seed provides a by-product in oil cake, a valuable cattle food, about 70 tons of which are produced in the process of extracting 8,000 gallons of oil; but this has only been in particular demand in times of drought and scarcity, half the Sydney output, we are informed, being exported.

Only about 200 tons of linseed per annum are produced in Australia, and that in Victoria, where it goes into general consumption for fodder and other purposes.

Messrs. Meggitt Limited are the only regular buyers of linseed for oil crushing, and the duty on oil plus the 10 per cent. bounty has evidently not enabled a price to be given sufficient to induce farmers and land-owners to embark in the cultivation of the plant, as against the price of imported linseed, which is free of duty. To encourage the cultivation of linseed by a duty on the seed would, the present time, still further embarrass the industry.

The crop of linseed in the United States equals about 26 million bushels per annum, most of this being pressed for oil. Russia averages 17 million bushels annually; the production of India varies from 15 to 20 millions, nearly all of which is exported; the Argentine, under average conditions, exports nearly 30 million bushels. In 1913, 17½ million bushels were grown in Canada, where the industry is sufficiently developed to warrant protection by a duty of 6d. per gallon on linseed oil, and 4d. per bushel on the seed.

Linseed grows best in the colder portions of the temperate regions, but is cultivated anywhere between latitude 10° to 65° south, and probably within similar latitudes north. Evidence was given by Mr. Meggitt that the grower should average half-a-ton of seed to the acre, but the average crop in Canada is said to be 11½ bushels (= 650 lbs.) to the acre. In North-west America, freshly-broken land under favorable conditions gives 10 to 15 bushels, the stalks of the plant producing 2 tons of straw. It is necessary to grow linseed in rotation with other products.

The price of linseed varies from £10 to £15 per ton, and the price the Australian oil miller can give depends on the price he receives for oil cake, which is a by-product. In England, America, and Canada this is in great request for stall-fed cattle, and, during the shortage of fodder in Australia, Messrs. Meggitt have easily disposed of all their output to advantage. In an ordinary season it has been necessary to ship about half of their tonnage of cake abroad. With abundant pastures in favorable seasons, the local demand for oil cake, other than for stall-fed stock, will necessarily be limited.

As the present necessities in Australia would entail the cultivation of 45,000 to 50,000 acres for linseed, a strong effort should be made to grow this in Australia. It would provide a further primary product in which the cost of labour in cultivation and harvesting is not excessive, and in which the value of the local demand would be equal to £250,000 per annum. If the State Agricultural Departments were asked to lend their assistance to put the matter plainly before the farmers, the result may perhaps be accomplished. Seed grown at Yanco and

other parts of the Riverina was declared to be excellent for oil, and the plant will thrive well in a great many districts.

Professor Bolley's work, quoted at length in *Farmers' Bulletin No. 274* on 'Flax Culture,' issued by the United States Department of Agriculture, has been of immense advantage to the growers of flax for seed and fibre in America.

To keep the present duty on linseed oil would require the duty on paints prepared for use, putty, &c., to be raised considerably to adequately protect the paint manufacturer; but, till the cultivation of linseed has progressed to an extent which would justify a duty on seed, the duty on oil is not only a direct hindrance to industry without any compensating advantage, but a very heavy burden on the community.

RECOMMENDATION.

The Commission recommends that the duty on linseed oil be removed, and suggests that the bounty on linseed delivered to a factory for the manufacture of oil be raised from 10 to 15 per cent. on the local market value for a period of five years, so as to provide a further inducement to the grower to cultivate the Australian requirements. In order to give time for consideration and action by the Agricultural Departments, it is recommended that a bounty of 3d. per gallon be paid on linseed oil locally expressed from local or imported linseed till 30th June, 1917, but that after that date a bounty of 6d. per gallon be paid on linseed oil the product of Australian-grown linseed. The Commission is of the opinion that this is the surest way to encourage the whole industry."

The main points in the above report which should appeal to Victorian farmers are—

Firstly, the large field for expansion presented before over-production for local requirements would be exceeded. Only 200 tons are at present produced per annum, which, on average returns, represents about 500 acres, and no less than 50,000 acres would be required to supply Australian consumption.

Secondly, the average price of linseed, viz., £12 10s. per ton, on an average crop of half a ton per acre (£6 5s. gross) should prove more profitable than many other crops now cultivated.

Added to the gross return from the sale of the actual crop, the Commission recommends a bounty of 15 per cent. per ton on linseed delivered to a factory for the manufacture of oil. This would increase the value of the crop to the grower 18s. 9d., or a total gross return on a half-ton crop of £7 3s. 9d. per acre for seed alone.

Where linseed is the objective of the farmer, the fibre is of small value, being coarse and hard, and it is doubtful at the present time whether it would command a price sufficient to warrant the necessary trouble in preparing it for market.

Some authorities argue that it is possible to obtain both seed and fibre from the crop, but all agree that where the crop is grown for fibre the seed will suffer in point of yield and also in its capacity to produce oil, while if grown for seed the fibre will be of inferior quality.

Good seed will give from 30 per cent. to 37 per cent. of oil, and bad seed from 25 per cent. to 30 per cent.

It will readily be seen, therefore, that manufacturers of either oil or fibre must reduce prices, unless growers specialize for either good seed or fibre. The crop under review in this article, however, relates to seed production primarily, and the necessary conditions suitable for its cultivation and treatment are being dealt with as a guide to intending growers.

SOILS AND CLIMATE.

New lands of good quality, either sandy loam, chocolate, or rich black loam, produce the greatest quantity of seed with the highest oil

content. Sandy or gravelly soils are not desirable, neither are heavy clays. Good drainage is essential, as linseed does not like cold, wet conditions. The crop is especially suited to new land just broken up, and is useful for subduing such land for succeeding crops. New land is also free from the diseases which are liable to attack the crop.

Cool climates are best, and there are many districts in Victoria suitable, notably along the foot-hills in the north-east, Gippsland, the Western District, and central portions of the State. The northern and north-western portions, excepting where irrigation is possible, have rather too uncertain a rainfall.

Flax has the reputation of being hard on the land when grown for several years consecutively on the same soil, but this is due more to disease, or what is known as flax sickness, than to its effect on soil fertility. For this reason a judicious system of rotation cropping is especially necessary to insure successful linseed production. On old ground a crop of linseed should not be grown more than once in every four years, while some authorities claim that once in every seven years should be the course to adopt. In fixing a rotation system, it should be borne in mind that the crop follows peas, rye, vetches, and maize well, but it is not desirable to sow linseed immediately after exhaustive root crops, such as mangels. Where possible, it should be the first crop after the land has had a spell under pasture, and will not be found to affect the soil for succeeding crops to a greater extent than the usual cereals grown on the farm. The following analyses, showing the comparative demands made by wheat and flax, go to show that, with the exception of nitrogen and lime, flax takes considerably less than wheat of the food constituents required:—

20 bushels Wheat: Nitrogen, 35 lbs.; phosphoric acid, 20 lbs.; potash, 35 lbs.; lime, 8 lbs.
15 bushels Flax: Nitrogen, 54 lbs.; phosphoric acid, 18 lbs.; potash, 27 lbs.; lime, 16 lbs.

PREPARATION OF THE LAND.

Linseed requires a very fine, firm seed-bed, and all possible care to eradicate weeds and get the land clean should be exercised. An early fallow in the autumn is especially valuable, in that it assists in cleaning the land, and gives greater opportunity for making a good seed bed. It will also be seen that the crop is a fairly heavy nitrogen feeder, and an early fallow will have the effect of supplying a sufficiency of this most essential plant food. On old land deep ploughing is necessary to obtain good results, and on loose, friable soils a heavy roller will compact the seed-bed, and provide better germination.

MANURES.

Artificial fertilizers are not much used for the crop, but there can be no doubt that they would be beneficial. Superphosphate, at the rate of 1 cwt. per acre, would just about supply an average crop with sufficient phosphoric acid for its development, while lime on soils naturally deficient should be applied at the rate of at least 5 cwt. per acre. Nitrogenous manures should not be required artificially if early fallowing has been practised, or a proper rotation followed, and on a poor soil 1 cwt. to 1½ cwt. of potash would be advisable.

pplies
should

be taken to use only well decomposed manure of this description; otherwise there is a liability of trouble from the seeds of weeds, grasses, &c.

The ploughing in of green crops, such as rye, pease, and clover on old land also has desirable results.

SEED.

Probably the chief reason for the low returns of linseed obtained in Victoria is due to the fact that varieties more suitable to produce fibre than seed have been grown. Where linseed is the object in view, only the seed best fitted to produce linseed should be used, and that of the very best quality. Too much stress cannot be laid on the importance of securing clean, bright, plump seed of varieties grown for seed only. Much attention has been given to this phase of the industry in North Dakota, United States of America, and the Argentine. Russia at one time was the chief source of supply, but improved methods of selection and treatment of the seed by the American growers appears to be ousting the Russian seed from its previous control of the market.

No. 3 Dutch "Rotterdam" seed is said to be one of the best varieties to grow, and the best of the American and Argentine would probably suit Victorian conditions. Fresh seed should be imported every second year, as a change of seed appears to be imperative after the second season.

Graded seed should be used, and before sowing it should be treated with a formalin solution of 1 pint of 40 per cent. strength in 45 gallons of water. This destroys the spores of the wilt-fungus, and actually benefits the seed. The best system is to sprinkle a heap of 8 or 10 bushels, and to keep turning the heap at the same time (half-a-gallon to each bushel is sufficient), and then cover with bags or a tarpaulin for a couple of hours; sow within twelve hours of treatment.

The rate at which the seed should be applied for linseed production is ½ to ¾ bushel per acre. For flax, more than twice this quantity is required.

The time to sow depends upon the season to some extent, as a warm seed-bed is of great importance. Autumn seeding, when the land is in good order, would suit mild districts, and spring sowing in the colder portions of the State which enjoy good rainfalls. The depth of seeding should not be more than half-an-inch, and the necessity for a finely cultivated seed-bed is here apparent, as in rough, cloddy land a uniform depth could not be maintained. Broadcast sowing is the most popular method, as the drill is liable to sow too great a depth on ridges or uneven land. After seeding the roller should follow to compact the soil round the seed to insure good germination; rolling is particularly necessary on friable, loose soils.

HARVESTING.

The crop is harvested for seed when the first seed-pods are browned and ready to open. The crop matures somewhat unevenly, but if cut with the binder at the stage mentioned, the greener pods will ripen on the straw. The sheaves must be stooked until dry enough to cart in and stack without danger of mildewing. A tarpaulin on the floor of the waggon used for carting in will save much waste, as the riper pods will shell easily when handled, and waste will occur unless precautions are taken to save the loose seed

The crop can be threshed with a flail, or on a spiked roller, or through an ordinary cereal threshing machine. In the last-mentioned case, however, the fibre, if of any value, will be ruined. All linseed should be stored in a dry place, as it is easily destroyed by mildews.

DISEASES.

Flax wilt is the most common trouble, caused generally by the condition known as a flax-sick soil. This is a fungus disease which enters the young plant either from spores on the seed or in the soil. This fungus develops inside the tissues of the plant, causing it to die.

Clean seed, treated with formalin, sown on land free from the disease, is the remedy, and a long rotation in which linseed is cropped once in five to seven years.

Manure containing flax straw, or from animals fed on flax, should *not be used*.

Other fungus diseases yield to the same methods of treatment, and the crop is not subject to serious injury from insect pests.

SUMMARY.

Victorian statistics show that the average yield of linseed in years 1910-11-12, from an aggregate of 2,256 acres, was 294 lbs. per acre. This is an exceedingly low yield, and is probably due to the fact that no special effort has been made to obtain the right seed, and cultivate for linseed only. The average crop in America is 650 lbs. per acre, and crops of 1,500 lbs. have been obtained. Crops of 1,000 lbs. of seed per acre should be easily possible on our comparatively virgin soils.

In growing for seed alone, much of the handling necessary where fibre is the objective is avoided. The cost of producing the crop should not exceed that of ordinary cereals. There are large areas of land fitted to produce linseed in Victoria, and there appears to be no reason why the crop should not become one of the most useful and profitable grown, provided proper attention is paid to the essential points in regard to the right seed, a reasonable rotation, and thoroughly good system of cultivation.

EXPERIMENTS in the manuring of grass lands were commenced in 1914 at five centres in Northamptonshire (England), on land typical of the very large areas of poor, cold pastures, on clay land, which are found throughout the country. Superphosphate was usually more effective than basic slag, although slag did better than might have been expected *considering it was applied late and the season was dry.*

THERE are men who understand breeding who do not even advocate the practice of breeding the sire to his grade offspring. It is a practice we believe, on the whole, gives better results, and more good comes from it than securing another bull, and it is more economical. *Hoard's Dairyman.*

THE FRUIT TRADE OF VICTORIA AND THE WAR.

By Ernest Meeking, Senior Fruit Inspector.

Introduction.

The cataclysm into which Europe was suddenly plunged at the beginning of August, 1914, has profoundly affected trade and commerce to the uttermost ends of the world. All industries and trades in all countries have more or less felt its effects, and on some industries the blow has fallen so heavily that years of effort will be required to bring about their re-establishment. One of our great statesmen long ago said that war leaves no nation as before, and the truth of this is now being brought home, not only to the belligerent nations, but to neutral countries as well.

Owing to last year's drought the effects of the war have not yet been fully manifested with regard to the distribution and marketing of our primary products. The time, however, is now at hand when the problem must be faced, and means considered whereunder this may be successfully solved. To no other of our primary industries is the present position fraught with such significance as it is to the fruit trade. Considering the perishable nature of fruit, and with a record crop in prospect, the largest oversea market gone, a scarcity of labour, and disarranged transport facilities, the need for prompt and organized effort to meet the changed conditions is obvious. However, "new occasions teach new duties," and, although the prospect is certainly grave, the task of successfully coping with the situation should by no means prove impossible.

The fruit-growers on the North American continent were faced with a much more serious position on the outbreak of war last year. Hostilities began as they were on the eve of harvesting one of the largest crops on record. Little or no time was available to arrange for meeting the situation, and no experience was at hand to afford a lesson. The transport facilities were completely upset, and none could foresee what period would elapse before they could be effectually readjusted.

How the situation was successfully met, both in the United States and Canada, cannot here be told; but it must suffice to say that the result was a veritable triumph of organized effort. There appears no reason why a like result cannot be accomplished in Australia with respect to the disposal of the incoming fruit crop, and the present article is written to show what are considered the ways and means to this end.

Oversea Markets.

GERMAN TRADE.

The loss of the trade with Germany has created a serious position in connexion with the oversea export of fruit, as, out of a total of 356,616 cases shipped to Europe during season 1914, 202,857 cases, or approximately 57 per cent., were shipped to Germany. Doubtless, a certain proportion of this was distributed from Hamburg and Bremen to other European ports, but the major portion of the total was consumed in Germany. Owing to its geographical position, and for other reasons, no other European port could at present take the place of Hamburg as a

centre for marketing and distributing facilities. Still, with the diversion of trade into new channels, which will doubtless eventuate as a result of the war, many other European ports should pay for exploitation.

It must not be forgotten that the trade with Germany has arisen within a comparatively short time, as, prior to 1902, no fruit was shipped direct from Australia to Germany. In that year the total export to Germany consisted of 5,250 cases. In fact, this argument might be altogether applied to the oversea fruit export trade, as it is only since 1907 that the industry has attained anything like important dimensions. Prior to that year no season's total had reached the six figures, but in 1907 the figures jumped to 180,766 cases from a total of 82,052 cases in 1906. The increase since 1907 has been rapid and continuous.

Trade with the United Kingdom.

FUTURE PROSPECTS.

From a total of 356,616 cases exported to Europe from Victoria during 1914 season, 153,759 cases, or approximately 37 per cent., were shipped to the United Kingdom.

A study of the channels through which the import trade in fruit enters the United Kingdom, and the extent to which the war is likely to affect the sources of supply, should be of value in attempting to gauge the position which the war may create with respect to our future share in the trade.

Apples.—In apples alone the United Kingdom, in 1913, imported from all countries 9,122,158 bushels, valued at £2,230,370. Of this total the United States of America contributed over two-fifths, and Canada slightly under two-fifths. The total from these two countries amounted to 7,422,024 bushels. European countries contributed less than one-eleventh; Australia, one-twelfth; other British possessions, excepting Canada and Australia, about one-one hundred and seventieth; Victoria, less than one-sixtieth.

As the United Kingdom obtains most of her apples from Canada and the United States, the stoppage of European supplies through the war should not, therefore, materially affect the situation so far as apples are concerned.

Pears.—In 1913 the United Kingdom imported 2,013,004 bushels, valued at £650,084. Of this total, Germany, Holland, Belgium, and France contributed 1,116,505 bushels, or more than half the total; the United States, 692,762, or slightly over one-third; Canada, 100,276 bushels, or under one-twentieth; Australia, 72,066 bushels, or approximately one-thirtieth. The main supplies from the continent of Europe came from Belgium and France. These countries contributed 893,492 bushels, or over one-third of the total.

As it would appear from the foregoing that there is likely to be a dearth of pears in the United Kingdom until the readjustment of trade after the war, the prospects for establishing a large and profitable trade in this fruit are very good, as it has been proved during recent years that pears can be successfully exported to the United Kingdom.

Plums.—Imports in 1913, 1,111,250 bushels, valued at £437,306.

The continent of Europe furnishes practically the whole supply, as a total of 1,109,803 bushels were imported from there in 1913. The

principal exporting countries were Germany and France, which shipped to Great Britain 644,051 and 314,230 bushels respectively. It would seem, therefore, that the shortage in plums will be even greater than the shortage in pears. The possibility of landing these in the United Kingdom in good condition has also been established.

Importing Centres in Great Britain other than London.

(1)—Hull.

Mention has often been made during the past few seasons regarding the expediency of opening up a regular trade with Hull. The optimistic opinions expressed in many quarters that regular shipments of fruit to Hull could be undertaken with profit appear justified by the results which have already been obtained from shipments to that port. The most notable example was the *Clan McArthur* shipment in 1913 season, when 12,500 cases realized the high average price of 12s. per case; 1,400 cases shipped per s.s. *Otway* last season also realized an average price of 12s. per case. When it is considered that upwards of 10,000,000 people reside within a 50-miles radius of Hull, and that it is the nearest distributing port for the principal northern counties of England, including such thickly populated centres as Yorkshire, Lancashire, &c., that it is the third port in the values of imports and exports in the United Kingdom and, in addition, the most conveniently situated British trading port for Holland, Scandinavia, Russia, Denmark, and other northern European countries, it seems strange that full advantage has not already been taken to ship fruit to this port. Shipments of soft fruits are imported direct through Hull into England from Holland, France, Belgium, Germany, and even Sweden, Norway, and Russia. Apples are imported from Canada, the United States, a few cases from Australia; oranges from Spain and Palestine; grapes from Spain; lemons from Sicily; and bananas from the Canary Islands and West Indies. The volume of the trade may be gauged when it is stated that in 1913 1,823,393 packages were imported, with an approximate value of £656,501. Of this total the hard fruits (apples, pears, citrus fruits, &c.), represented a value of approximately £300,000, or nearly half the total value. The value of the apples and pears was approximately £150,000. Two-thirds of these were imported from America. The importation of American apples is not so large as at some of the other British ports, and is due to the fact that Hull is not so favorably situated as Liverpool, Bristol, and London for the American trade.

Fruit is mainly imported into Great Britain between the months of May and September. During this period the Hull fruit sales are the most numerously attended of any sales in the United Kingdom, and are patronized by foreign buyers, or their representatives, in large numbers. But, in addition, the sales in Hull attract buyers throughout the year. All the facilities for disposal of fruit are, therefore, available. The markets are more accessible to the wharfs than is the case at either London or Liverpool, and consignments can, therefore, be handled more expeditiously and cheaply.

A large proportion of the apples shipped from Australia to London and Liverpool are railed to Hull for export to the Continent, as is shown by the fact that hard fruits to the value of £386,326 were disposed of at Hull and exported to Continental ports. This means the following additional railage cost:—London to Hull, 24s. 3d. per ton of

2-ton trucks; smaller lots, 28s. 7d per ton: Liverpool to Hull, 16s. 6d. per ton. This cost must ultimately fall on the Australian grower, and would be saved if shipments were made direct to Hull.

The main reason why fruit has not been shipped in large quantities from Australia to this port has been the lack of direct shipping facilities; but this was overcome to some extent last year by the monthly service of steamers belonging to the "Clan" line. With the diversion of trade, which it is anticipated will occur, a fortnightly service will doubtless be arranged for in the future, and there seems no reason why Hull should not, to a large extent, occupy the position in connexion with the fruit trade which was held by Hamburg in the past. In fact, had direct shipping facilities been available to Hull, it is probable that Hamburg would never have attained its position of the leading port for Australian fruits.

The following is a comparison of the pre-war cost of landing a case of fruit in Hamburg, London, and Hull:—

Items of Charges.	Hamburg.	London.	Hull.
	per case.	per case.	per case.
Melbourne Charges—	s. d.	s. d.	s. d.
Cost of case	1 0	1 0	1 0
Packing	0 2	0 2	0 2
Wrappers, nailing, &c.	0 1	0 1	0 1
Rail freight	0 3	0 3	0 3
Supervision fee	0 3	0 3	0 3
Insurance, 12s. 6d. per cent. *ad valorem* ..	0 0¾	0 0¾	0 0¾
Oversea Freight—			
Hamburg, 65s. per ton	2 8½		
London, 60s. per ton		2 6	
Hull, 60s. per ton			2 6
European Charges—			
Landing, carting, &c.	0 8	0 6	0 4½
Selling charges	0 6	0 6	0 2½
	5 8¼	5 3¾	4 10¾

The cost of marketing a case of Victorian-grown fruit in Hull was thus 5d. less than in London, and 9½d. less than in Hamburg.

(2)—MANCHESTER.

This city is in adjacent proximity to the densely populated counties of west and north-west Great Britain. Over 10,000,000 people are included in its distributive area, 2,000,000 of these being in the immediate vicinity of the ship canal. It has quay and dock accommodation, and is also provided with cool storage accommodation adjacent to the docks. The charges for disposal of fruit are lower than in London, being as follows:—Manchester, 6d. per box of 40 lbs., plus 2 per cent for brokerage of sale in the auction room; London, 9d. and 10d. per box of 50 lbs., plus 5 per cent. for brokerage. Unfortunately, no direct steam-ship service from Australia has yet been opened, although within a radius of 70 miles of Manchester there is a consuming population twice as large as the combined population of Australia and New Zealand.

(3)—OTHER BRITISH PORTS.

There are many other British ports, such as Glasgow, Bristol, &c., which are in themselves centres of large populations, and which should provide good markets for our fruits.

American Trade.

CALIFORNIA AND VANCOUVER.

Several trial shipments have been forwarded by the Department of Agriculture to San Francisco and Vancouver. This was undertaken in order to show that at certain times of the year a profitable trade could be established if a direct steam-ship service were in commission. Although disabilities such as transhipment, and high freight charges and undue handling of the fruit, were prohibitive to the establishment of a regular trade, yet the prices obtained showed that, with a direct service, fruit, and more especially soft fruits, could be shipped with great advantage.

Inquiries show that the prospects of a direct service to these ports are not encouraging, as the Union Steam-ship Company state that, owing to want of inducement, they cannot see their way clear to undertake this. Last season the *Canada Cape* loaded a small cargo here, but as nothing was added at Sydney the trip was abandoned.

THE EASTERN STATES OF AMERICA.

It has frequently been stated that a good market for apples and pears exists in the eastern States of America, particularly during the months of February, March, April, May, and June. A return for the last 25 years shows the average prices for apples per box during these months to be as follows.—February, 1 dollar 8 cents; March, 1 dollar 11 cents; April, 1 dollar 19 cents; May, 1 dollar 28 cents; June, 1 dollar 23 cents; or approximately an average price of 1 dollar 18 cents —equalling 4s. 11d. per case. These figures must not be taken as an indication of the prices which would be realized for well-packed Australian apples, as the prices refer to American stocks which have been kept in cool storage for many months. It would appear, however, that unless a direct steam-ship service is established, and freights are kept as low as possible, the New York market and other markets in the eastern States will not provide a permanently profitable outlay for our fruits.

No figures are available concerning the prices for pears, but small shipments which have been sent from Tasmania to New York have realized profitable returns.

All apples shipped to the United States should be packed under the numerical system of packing. They should be packed in boxes of the sizes provided by law, viz., 18½ inches long, by 10½ inches deep, by 11½ inches wide.

From the latest reports to hand, the crop prospects for the present (1915) season in Canada and the United States of America may be summarized as follow:—

There has been no improvement in the condition of the apple crop in any part of Canada since the last report, with the exception of Nova Scotia, where the weather of late has been favorable to the colouring of the fruit. Continued wet weather in Ontario for the past six weeks has, if anything, lowered the quality of the fruit in some sections by causing the development of fungus diseases. In Nova Scotia the crop will be particularly poor in quality, and

probably will not average more than 30 per cent. of No. 1 apples. Taking the Dominion as a whole, it seems probable that 1915 will be long remembered as a year of low production and poor quality.

The total production of apples in the United States for this season is estimated at 205,333,000 bushels, as against 253,200,000 bushels last year. Peaches are estimated on the same date at 59,707,000 bushels, as against 54,000,000 last year, and pears at 11,068,000 bushels, as compared with 12,086,000 in 1914. The following are the percentages of the apple crop in the large apple-producing districts. These are based on 100 as representing full or standard crop:—

	Condition 1st August, 1915. Per cent.	Ten-year Average. Per cent.
New England States	49	65
Eastern States, N.Y., Pa., &c. ...	60	61
Middle West	69	53
Western States	75	77

This gives a 63 per cent. total for the whole of the United States.

There is little prospect, therefore, that American stocks will seriously compete with our apples on the markets of the United Kingdom during the coming season. There seems, moreover, good ground for believing that, in spite of the low average returns indicated by the figures above, high prices for Australian apples could be obtained in the eastern States during the months of February, March, April, May, and June of 1916.

Owing to the shortage of stocks, due to last season's failure, American apples are at present bringing from 18s. to 22s. per case in Australia, and there is every indication that our exporters would obtain similar results if judicious shipments were made to New York and other cities on the Atlantic seaboard.

They would strike markets where fruit was scarce, and, owing to the enormous influx of capital from Europe, where money was plentiful. In fact, it may be confidently expected that America would absorb considerably more fruit than the quantity represented by the loss in the German trade.

The manner in which the American apples, which are now arriving in Australia, are packed, graded and boxed, provides a striking commentary on our want of organized attention to these matters. The fruit in each box is carefully wrapped, packed, and graded with respect to uniformity in size, colour, variety, shape, and soundness, and freedom from disease. The boxes themselves are constructed of clean-dressed pine, bear an attractive stencilled brand of the association by whom they are packed: a statement as to the size and number of apples in box and guarantees as to the size of the box, and the soundness and freedom from disease of the fruit. All the information that an intending buyer requires is therefore shown on the box, and the fruit may be safely purchased without inspection.

Local Trade.

In detail, the following quantities, in bushels, of large fruits gathered in Victoria during 1913 were:—Apples, 2,036,756; pears, 669,898; quinces, 90,119; plums, 260,830; cherries, 152,257; peaches, 289,731; apricots, 138,881; oranges, 44,039; loquats, 6,006; passion fruit, 6,360; nectarines, 5,130; lemons, 48,170; figs, 25,233. Total, 3,773,400.

The prospective total quantity of fruit for the incoming season promises to exceed the 1913 season, and will probably constitute a record.

Small Consumption of Fruit in Victoria.

When it is considered that only slightly over 50 per cent. of the large fruit grown is consumed locally, and that only 3½ ounces of fruit per day per individual is consumed, as against 9 ounces of meat and 12 ounces of bread, little difficulty should be experienced in increasing the local consumption at least another 25 per cent. If this could be accomplished, the danger of glut should be totally avoided, and the present serious outlook would be entirely removed, as the remaining 25 per cent. should be easily disposed of in the Inter-State and oversea markets.

Improved Methods of Local Distribution.

The better local distribution and sale of our fresh fruits could be brought about by extending the system of street selling in Melbourne, and by establishing a single case retail trade to provide householders in the suburbs. The State Royal Commission, in its report, recommends an amendment of the law relating to hawking and dealing to permit the issue of an annual license to hawkers and dealers of fruit and vegetables, in lieu of the local market rates at present collected, and also recommends the establishment of sixty-four stands in various portions of the city. This would undoubtedly tend to dispose of considerably greater quantities of fruit to the public than is possible under present arrangements, as one of the great drawbacks to the local consumption of fruit is the want of facilities for direct retail sale to consumers.

Recommendations of Royal Commission.

The two Royal Commissions which have been held in recent years to inquire into the fruit industry have both reported that the industry suffers under many disabilities. These disabilities have been found to be nearly all connected with the distribution and marketing side of the industry, and have confirmed the opinions which have been expressed in the columns of this journal during the past few years. The last Commission, which was appointed by the present Parliament, and which took evidence during the current year, stressed in its recent report the importance of the industry, and urged the imperative necessity for immediate attention to its development on sounder and more improved lines than those now existing. Their recommendations regarding the provisions which should be made against glut are worthy of the most earnest consideration of all concerned, especially at the present time, when the industry is faced with all the factors which tend to bring this about.

The following facts in connexion with the present position of the local and Inter-State trade may serve to indicate how this position could be materially improved:—

Present Channels of Consumption.

In 1913 (which may be taken as the last heavy pre-war crop as it was up to the present the heaviest on record) a total of nearly 4,000,000 bushels of large fruits and 60,000 bushels of small fruits, exclusive of grapes, were raised in Victoria. Of this total 500,000 packages (approximately 12 per cent.) were exported oversea; 1,000,000 bushels (approximately 25 per cent.) were manufactured into jams, jellies, &c.;

60,000 bushels (approximately 1½ per cent.) were converted into dried fruits. This gave a total of 1,910,000 bushels exported, manufactured, or otherwise disposed of, and left a total of 2,090,000 bushels, or approximately 52½ per cent. for local consumption.

If standardized methods of packing were established here, there is no doubt that a regular and permanent single case retail trade could be established with householders in the suburbs. This has been successfully carried out in other countries under various systems. One of the most efficient is to circularize or canvass householders, stating the conditions under which apples will be delivered, and quoting prices. The circular may be accompanied by a sample apple, and prices are quoted at which a full box, or half-box, similar to sample, can be delivered at the house in the suburbs, or office in the city. This campaign has resulted very successfully in many cities, but, of course, requires combined and organized methods to properly carry out.

Inter-State Trade.

The kinds of fruit exported to other States consisted chiefly, in 1913, of apples, cherries, and plums. Of this total, pears formed over 50 per cent.; apples, 20 per cent.; plums and cherries, approximately, 30 per cent. Our best customers were Queensland and New South Wales. Most of the fruit was transported by Inter-State boats as ordinary cargo. As a result, its condition on arrival prevented its keeping for a sufficient length of time to enable proper distribution throughout the States to which it was shipped. There seems little doubt that, if the Inter-State boats were provided with sufficient cool chamber accommodation, and more careful methods of picking, packing, and handling were applied than those now in vogue, fruit could be landed in better condition at Inter-State ports than is possible at present. The rates of freight charged on fruit from Melbourne to other Inter-State ports is considerably higher than the return rates, and it would appear that there is justification for asking that these be lowered. A large quantity of fruit is forwarded to other States by rail, and the Inter-State rail gauge between Victoria and New South Wales, necessitating the transfer of fruit at the border, constitutes a serious drawback. Considering the large proportion of trade which is occupied by the shipment of fruits to Inter-State markets, the better development of these markets would well repay effort.

Extension of Dried Fruit Industry.

Judging by the figures, it would appear that the proportion used in 1913 in the manufacture of dried fruits (1½ per cent. of the total crop) could be materially increased by the establishment of up-to-date drying plants. These plants could, in many instances, be erected in proximity to the cool stores in the various fruit-growing centres. The process of drying fruits is very simple and requires nothing more than ordinary care and intelligence to carry out successfully. The old methods of drying fruits by sun heat, or by means of small kilns in the orchard, is fast becoming obsolete, and in California and other large fruit-producing States of America, large plants are utilized, which successfully carry out in a few hours the process which required five or six days under the old method. For example, in one of the American States, a company

has erected an evaporator capable of turning out 10 tons of prunes, 12,000 lbs. of cherries, or 15,000 lbs. of peaches or apricots, in 24 hours. The method is carried out by running the fruit through the evaporator on steel cars worked by a continuous belt or chain, which provides for an unbroken procession of fruit through the evaporator. The temperature used is from 212-240 degrees Fahrenheit, and it takes 3 hours to evaporate apples; 8 hours for cherries; 10 hours for peaches; 8-10 hours for apricots, and 6-12 hours for prunes. A few plants such as those in the large fruit-growing centres, would materially assist in solving the problem of disposing of the surplus crop in seasons when fruit is plentiful, and would, moreover, assist in keeping down expenditure to a minimum.

The following figures show the losses in weight for the various kinds of fruit:—

Fruit.	Fresh.	Dried.
Apples	100 lbs.	12 lbs.
Pears	100 lbs.	12-15 lbs.
Plums	100 lbs.	25 lbs.
Apricots	100 lbs.	10-12 lbs.
Peaches	100 lbs.	10-12 lbs.

The cost of conversion for a bushel of the fruits mentioned averages from 8d. to 1s. 10d., and varies in lbs. yielded per bushel of fresh fruit from 6 to 8 lbs. of the dried product.

A good market exists in Australia for dried fruits at profitable prices, and the prospects for the expansion of the export trade oversea are of the best.

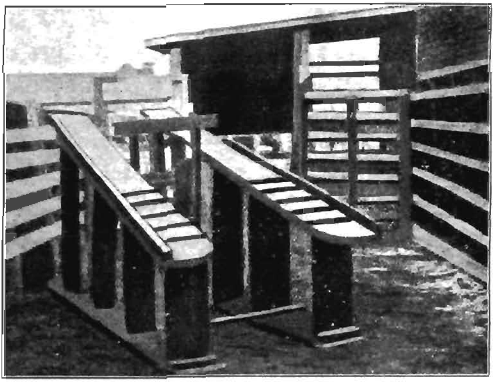
Summary.

Prospects for the incoming season may be briefly summarized as follows:—

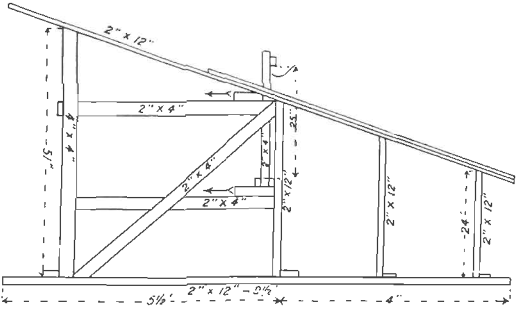
1. A record crop is expected in each of the Australian States.
2. This season it is estimated that had shipping and marketing conditions remained normal the following quantities in bushels would have been available for oversea export:—Tasmania, 1,500,000; Victoria, 500,000; South Australia, 300,000; West Australia, 250,000. Total, 2,550,000 bushels.
3. Transport and other facilities for placing fruits on oversea markets will be disarranged.
4. Space will, in all probability, be obtainable for ⅗ only of the full available surplus.
5. This means that a much larger quantity than usual will be left for disposal on the local and Inter-State markets; but with organized effort in the directions indicated, this should not be impossible, and the creation of a glut, with consequent loss, should be easily avoided.

A BREEDING RACK.

The accompanying illustration shows a very convenient breeding rack, not only for heifers, but for mature cows when bull is large and



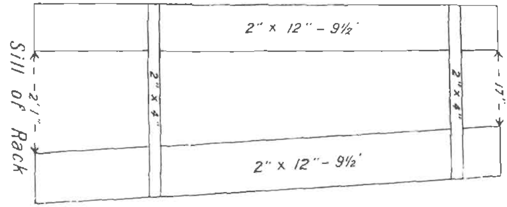
Breeding rack with adjustable stanchions for use with large bulls.



Side view of breeding rack showing dimensions and construction.

heavy. It must be strong and well braced to stand the strain. Cleats placed above the surface of planks at the side are important. The

frame must be long and narrow, and the adjustable stanchion so placed that the occupant can be held well back. The height of the platform is 51 inches in front, and is constructed on an incline which makes the rear 24 inches high. The stanchion is supported by 2 x 4 inch pieces attached to each side and resting upon the horizontal 2 x 4 of the frame. With a series of holes in the latter, and a hole in each of the pieces



Sill of breeding rack.

attached to the stanchion, it may be set and held at any desired length by using bolts dropped loosely in the holes.

Loose dirt or cinders at the rear of the rack, that can be filled in or dug out quickly, will be found convenient in overcoming the difficulty arising from large or small cows.—*Hoard's Dairyman.*

FATS IN FOOD.

At a recent meeting of the American Medical Association, Professor Mendel, of Yale University, presented an exceedingly interesting paper on foods and nutrition, in which he gave an account of studies made by him for the purpose of determining the food value of various commonly used fats. In experiments upon young animals, Professor Mendel found that when lard was the only fat used there was a cessation of growth and a decline in weight at the end of three months. When butter-fat was used, there was no sign whatever of failure after feeding for a year or more.

Cotton-seed oil is mentioned by Professor Mendel as belonging in the same category with lard. In the same class he placed numerous other chemical fats which have been recently offered as a substitute for butter.

The processes to which these artificial products are submitted are believed by many authorities to depreciate, if not destroy, their food value. Many facts have come to light in recent times which indicate that many of the processes employed in the preparation of food are damaging, and sometimes highly destructive. Long cooking at high temperature, for example, is now known to destroy the vitamines which play such a useful part in all our food.

MILLING AND BAKING TESTS ON ARGENTINE AND WALLA WHEATS.

(Continued from page 666.)

By P. R. Scott, Chemist for Agriculture, and F. G. B. Winslow, Departmental Miller.

From the world-wide reputation of the baking quality of wheats grown in the Argentine Republic, and on the Pacific Coast of America, it would be natural to infer that flour, milled from these wheats would, on baking, return well-piled loaves of good texture and colour. Advantage was taken of testing the quality in that respect of a flour milled from a mixture of wheats recently imported. The composition of the flour was made by milling three parts Red Fife, three parts Argentine, and five parts Blue Stem and Walla.

The flour, to all appearance, possessed a fair bloom and colour, and compared favorably with our ordinary home-grown flour. On testing its water absorption power and gluten content it exhibited properties which led both of us to believe that it was lacking in quality, and hardly up to the standard requisite to insure success in turning out an average quality loaf when baked by the usual method.

Gluten is of special importance, as the power of making bread from wheat flour depends on its presence; it is therefore a characteristic constituent of wheat.

Gluten is subject to variation in quality and quantity, the strength of the flour depending, among other things, more on the quality than the quantity.

Gluten, washed from a strong flour, is generally tough and elastic; from a weak flour, soft, sticky, and lacking in cohesive power resembling soft putty. To determine the gluten content the flour is kneaded into a dough by admixture with water, a portion of the dough is taken and treated to a washing process to wash away the starch particles and leave the gluten. When so treated the dough of some flour will remain in mass, without any apparent separation of gluten particles. The dough of other flour may become pasty, and particles of the gluten may separate from the mass, and add to the difficulty of complete recovery of the gluten. This latter property was found to belong to the flour under observation. Additional evidence of the qualities of the flour may be afforded by the water absorption test. Dough made to a standard consistency will exhibit different properties when gently pulled apart between the hands. It will either show a certain amount of elasticity, enabling the operator to stretch it without breaking for varying distances, or if made from a weak flour will be lacking in elasticity, and tear or break off instead of stretching. The flour, under observation, was lacking in elasticity, and may be considered as of weak strength. The baking test will usually give a better idea of the quality of the flour for bread making than any other. The flour baked by the ordinary method was found to prove much quicker in the trough than the ordinary local flour, and when baked the loaves were of small volume and very open texture, and the colour of the crumb dark. As a result it

of yeast food added, and the length of time allowed in the proving troughs. In all, six batches were treated and baked as follows:—

1. Using one-third quantity of yeast food, fairly tight dough, short proving.
2. Using one-third quantity of yeast food, fairly tight dough, long proving.
3. Using ordinary quantity of yeast food, fairly tight dough, short proving.
4. Using ordinary quantity of yeast food, fairly tight dough, fairly long proving.
5. Using ordinary quantity of yeast food, fairly tight dough, long proving.
6. Using one-third quantity of yeast food, fairly tight dough, usual time proving.

The loaves baked were afterwards measured and their colour and texture noted—20 points were allowed as a maximum for texture and colour—

Volume.	Texture.	Colour.	Remarks.
1340 ccs.	19	17	Fair crust, rather foxy.
1550 ,,	16	17	Crust white, rather foxy.
1355 ,,	15	17	Crust white, rather foxy.
1355 ,,	15	17	Crust fair, rather dull.
1550 ,,	16	17	Crust fair, dull.
1475 ,,	16	17	Good general appearance, fair crust.

Before passing judgment on the loaves they are allowed to stand overnight. The general appearance of the loaf is then considered, the points noted being more particularly the colour of the crust, and the freedom from cracks and roughness. The volume is then measured and the loaf cut.

A well-piled loaf should present the appearance of evenness of pores. The pores should be comparatively small, the body soft and pliable; on pressure being applied to the bread the pressed portion should immediately return to its original face. Judged accordingly, the majority of the loaves when examined were found to be of indifferent quality, lacking evenness of pores; the texture dull and sodden. Number one batch gave loaves of very fair texture, the next best was No. 6. This batch, although the loaves were found to be of poor texture, the volume and general appearance of the loaf was superior to that of the No. 1 loaf. Reduction in the amount of yeast food resulted in a more gradual fermentation and better textured bread.

Further tests were made on wheats imported into this State by the s.s. *Highbury* and s.s. *Calulu*. These shipments comprised some of the wheat known as Red Fife and Blue Stem. The usual chemical and baking tests were applied giving the results.

CHEMICAL AND PHYSICAL TESTS.

Milling No.	Variety.	Bushel weight.	Protein content in wheat.	Flour yield.	Strength flour.*	Gluten. Wet.	Gluten. Dry.	Nitpogen content in flour.	Crude protein in flour.	Colour.
			per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	max. 20.
438	Calulu Red Fife	64·1	10·48	73·0	46·0	23·1	7·7	1·42	8·87	14
439	Highbury Red Fife ..	64·1	8·75	75·1	46·4	22·6	7·5	1·28	7·99	14
440	Calulu Blue Stem	63	10·31	71·1	43·8	18·6	6·2	1·37	8·60	14
441	Highbury Blue Stem ..	63	8·81	72·2	44·2	17·1	5·7	1·17	7·31	14

* [illegible] for 200 lbs. flour.

A marked difference is found in the protein content of these shipments, in the *Calula* cargo both the wheats contained a higher percentage. The gluten content, however, was not so variable, but may be considered as very low, and judged by indications given during the operation of determining the gluten content the quality of the gluten would be considered as weak.

The baking test of these flours gave the following result:—

Milling No.	Variety.	Colour.	Texture.	Volume.	Water in dough.	Remarks.
		max. 20.	max. 20.	ccs.	ccs.	
438	Calulu Red Fife	5	10	1,345	193	Fair crust inclined to be white
439	Highbury Red Fife ..	5	10	1,340	197	Fair crust inclined to be white
440	Calulu Blue Stem ..	5	10	1,350	186	Very fair crust and appearance
441	Highbury Blue Stem ..	5	10	1,400	188	Very fair crust and appearance
	Argentine .. 33 per cent. Blue Stem .. 66 per cent.	7	12	1,420	190	Fair crust and appearance

From the general appearance of the loaves all may be classed as of very poor quality and inferior in all respects to those obtained from the blend of flour containing Argentine. At the same time as these flours were baked, a mixture of flour, Argentine 33 per cent., and Blue Stem 66 per cent., was baked, and the result was a decided improvement in the general appearance of the loaf, the colour, texture, and volume being better in each respect. It would be advisable, therefore, to use some stronger baking flour, such as Argentine or Australian, to mix with these to obtain a flour capable of producing a loaf suitable for local requirements.

On account of the poor quality of the gluten found in former shipments of the Pacific Coast wheats, samples of flour were obtained from two representative mills. These samples were submitted to the baking test. The method of baking followed was practically similar to the general practice in common use by the Victorian baker. The straight dough process used gave satisfactory results both as regard the general appearance of the loaf and its texture and colour.

By way of experiment other batches of loaves were baked, using these flours, by trying the effect of a scald. The scald was obtained by taking approximately 3½ per cent. of the flour and a small quantity of water, and boiling the mixture. It was then allowed to cool down to 85 degrees F., and a standard dough was prepared. The dough was afterwards kneaded in the usual way, and placed in the proving chamber, the temperature being kept constant at 80 degrees F. This batch was found to prove much quicker than an ordinary dough, but produced a loaf of decidedly superior volume and general appearance to the batch baked by the usual routine method.

For flour of similar quality the use of a scald appears to be an advantage, and, although entailing extra work, is worthy of more than passing mention, and may be recommended for an extended trial on a

RESULT OF BAKING TEST.

Flour.	Water absorption.*	Gluten.		Water used in making dough.	Volume of loaf.	Weight of loaf.	Colour.	Texture.	Remarks
		Wet.	Dry.						
	qts.	per cent.	per cent.	ccs.	ccs.	grams.	max. 20.	max. 20.	
1	47	21·3	7·5	200	1,550	465	16	16	*Ordinary treatment given, crust foxy, fair sized loaf*
	47	21·3	7·5	200	1,500	464	16	16	Fairly long proof, more yeast food, crust foxy, fair sized loaf
	47	21·3	7·5	200	1,400	481	17	17	Scald used, ordinary proof, good crust, and fair rise in oven
2	47	21·4	7.4	200	1,530	480	16	17	Ordinary treatment, crust foxy, fair sized loaf
	47	21·4	7·4	200	1,525	484	17	17	Scald used, good crust and general appearance

* Quarts of water per 200 lbs. flour.

THE WINE YIELD OF THE WORLD IN 1914.

The following table, published by the *Moniteur Vinicole*, of Bordeaux, shows the wine yield of the world in 1914:—

	Hectolitres.	Gallons.
France (including Corsica)	59,981,492	1,319,592,824
Algeria	10,317,719	226,989,818
Tunis	300,000	6,600,000
Italy	43,046,000	947,012,000
Spain	16,167,940	355,694,680
Russia	4,800,000	105,600,000
Austria-Hungary	4,500,000	99,000,000
Portugal	4,000,000	88,000,000
Azores—Canary, Madeira ...	30,000	660,000
Greece and the Islands	2,750,000	60,500,000
Germany	1,000,000	22,000,000
Turkey and Cypress	800,000	17,600,000
Roumania	661,000	14,542,000
Switzerland ...	507,000	11,154,000
Serbia	350,000	7,700,000
Bulgaria	40,000	880,000
Luxembourg	1,000	22,000
Argentine Republic ...	5,500,000	121,000,000
Chili	4,000,000	88,000,000
United States	1,740,000	38,280,000
Brazil	450,000	9,900,000
Australia	300,000	6,600,000
Uruguay	200,000	4,400,000
Cape of Good Hope ...	175,000	3,850,000
Peru	160,000	3,520,000
Bolivia	70,000	1,540,000
Canada	17,000	374,000
Mexico	8,500	187,000
Persia	2,500	55,000
Egypt	1,500	33,000

METHODS OF MILK RECORDING IN SCOTLAND.*

By Alex. Lauder, D.Sc., Professor of Agriculture, East of Scotland Agricultural College.

Originated in 1903 by the late Mr. John Speir, of Newton. He obtained a grant of £200 from the Highland Society and made a beginning in three counties in that year.

Progress of the work:—

Year.	Number of Cows.	Year.	Number of Cows.
1903	1,342	1909	9,202
1904	389	1910	9,514
1905 ..	815	1911	13,965
1906 . ..	2,688	1912	18,356
1907	3,931	1913	22,300
1908 .	8,132	1914	25,000

This work is now carried on by the Scottish Milk Records Committee. This is a body consisting of representatives elected by—

1. The local Milk Record Societies.
2. The three Scottish Agricultural Colleges.
3. The Highland Agricultural Society.

The Committee receives a grant from the Development Commissioners, which amounted to £2,000 for 1914. It is hoped that this grant may be further increased next year. A grant of £40 is also received from the Ayrshire Herd Book Committee.

Local Societies.—The work of the society is carried out through local committees or societies. They consist of the dairy farmers in a district, and are of such a size as to provide work for the whole of the time of one man in the work of testing. The number of herds in each society varies from twelve to twenty-four, depending on the number of cows in each herd. In Ayrshire and Renfrewshire the average number is about thirty; in Wigton and Kirkcubright the herds are larger, averaging about fifty.

Tests for the amount of milk fat may be made every 14, 21, or 28 days, according to the number of members in each society.

A test every 21 days is found to give satisfactory results, and is the most common period in Scotland.

Tester arrives in the afternoon. Weighs and tests evening milk, and the milk the following morning; all testing and weighing is done by tester. The farmer supplies necessary details as to feeding, times of calving, &c. If the number of cows in the herd exceeds 50, the tester stays for two days.

The yield of milk is determined in pounds. Fat determined, and then the yield expressed in terms of pounds of milk of 1 per cent. fat.

* Synopsis of address presented before the British Association for the Advancement of Science, Australian meeting, Melbourne, 19th August, 1914.

This method has been adopted as the simplest method of comparing the yields of different cows on a common standard of quality.

Results.—Two copies made:—

(1) to farmer;
(2) to office of Central Committee.

Finance.—The annual expenses of a local society, exclusive of the Board, of the recorder, and of the cost of transference from farm to farm, may be put at about £80.

The recorder is boarded by the farmer, who generally drives him to the next farm he is visiting. In some cases, however, the recorder is provided with a horse and trap by the local society.

Grant from Central Committee.—The salary of the recorder varies from 20s. to 25s. per week, exclusive of board.

In some societies the total expenditure is simply divided amongst the members; in others the members are charged so much per cow. This comes to 1s. 9d. to 1s. 10d. per annum, and each member is charged on a minimum of 40 cows, £3 10s. to £3 13s. 4d. per annum.

The secretary of the local society is generally one of the members, and in this case is unpaid. In some cases three or four societies in the same county join together and employ a paid secretary, generally a solicitor.

The general results of the work of the societies during the comparatively short time they have been in operation have been, by the elimination of unsuitable cows, to generally increase the yield of the herds and also their value, particularly for export purposes. The improvement has, perhaps, been most marked in the large herds kept in Wigtonshire and Kirkcubright, where formerly the management was, perhaps, less personal than in Ayrshire. In the course of eight years the average yield per cow has increased in some herds by from 100 to 200 gallons.

The following record of two herds in Wigtonshire may be given as an example:—

	Herd No. 1. Average yield in gallons.	Herd No. 2. Average yield in gallons.
1907	496	527
1908	506	600
1909	523	585
1910	572	625
1911	617	657
1912	652	680
Increase	156	153
	Gallons per cow.	Gallons per cow
= (@ 6d. per gallon)	£3 18s.	£3 16s. 6d.

The increase in the value of the pedigree milk record Ayrshires for export purposes has been estimated at about 50 per cent.

Indirectly the keeping of records has had the effect of greatly stimulating the interest of the farmers in their herds, and a considerable improvement in breeding has been the result. In this connexion the importance of the sire being descended from a dam of good milking qualities has been amply proved by experiment, and cannot be too strongly insisted upon.

Classification of Cows.—

Good cows = 2,500 gallons of 1% fat.
Good cows = 714 gallons of 3.5% fat.
Good heifers = 2,000 gallons of 1% fat.
Good heifers = 570 gallons of 3.5% fat.
Bad cows = 1,660 gallons of 1% fat.
Bad cows = 474 gallons of 3.5% fat.
Bad heifers = 1,330 gallons of 1% fat.
Bad heifers = 380 gallons of 3.5% fat.

Cattle Shows.—The judging of cows at cattle shows on purely or largely "fancy" points is gradually giving place to the more rational system of also taking into account the capacity of the animals as milk producers. Three classes are now commonly adopted:—

I. For cows giving over 1,200 gallons.
II. For cows giving over 1,000 gallons.
III. For cows giving over 800 gallons.

Gavin's Work on the Interpretation of Milk Records (Journal R.A.S., vol. 73, p. 153; J.A. Sc., vol. V., pt. 4, p. 377 (1913); vol. 5, pt. III. (1913) p. 309).

Gavin has carried out a statistical inquiry into the records of a large number of cows; these records extended over 24 years, and were kept at Lord Rayleigh's dairy farms in Essex. In particular he has investigated two questions:—

(1) How to define a cow's milking capability as accurately as possible by a single and unqualified figure.
(2) On the accuracy of estimating a cow's milking capability by her first lactation yield.

(1) DEFINITION OF MILKING CAPACITY OF A COW.

Difficulty of assigning a definite numerical value to the inherent milking capacity of cows. Breeders generally rely on such figures as—

1. Total yield per calendar year.
2. Total yield per calf.
3. Average yield per week, &c.

The enormous fluctuations found in the same animal show them to be subject to a variety of outside influences. To make them of value it is necessary to enumerate in every instance the particular circumstances in which the cow in question has been placed during the period taken.

This is obviously impossible when a large number of cows have to be dealt with, and it becomes necessary to define a cow's milking capability as accurately as possible by a single unqualified figure.

Exterior Circumstances Affecting Yield.—

1. Age of Cow.
2. Number of weeks in milk.
3. Number of weeks' rest before calving.
4. Interval between calving and subsequent service.
5. Time of year of calving.
6. Food, weather, and general treatment.

Selection of Figure.—After various trials the following figures were subjected to a careful statistical examination:—

1. Average, *i.e.*, average yield per day from 5th to 12th week after calving.
2. Maximum, *i.e.*, maximum yield of any one day.
3. Revised maximum, *i.e.*, maximum daily yield maintained or exceeded for not less than three entries in the record-book

Example, four cows: 16, 16, 16-16, 17, 17-16, 18, 16-16, 17, 18 quarts.

The revised maximum is taken as the highest yield common to all three entries; thus, in all the above cases, the revised maximum is taken as 16 quarts. The result of the inquiry points to the revised maximum being the most satisfactory figure.

(2) THE ACCURACY OF ESTIMATING A COW'S MILKING CAPABILITY BY HER FIRST LACTATION YIELD.

Desirability of knowing at the earliest possible date whether a cow is worth keeping or not. How far can the milking capability of a cow be estimated from the yield she gives with her first calf. The revised maximum is used as indicating the milking capacity of the cow in each case. From an examination of the statistics available Garvin has constructed a table showing the probable milking capacity of a cow and its relation to the first lactation yield.

Summary.

	1st Calf R.M.	Gallons.
Class I.	5–9 quarts	604
" II.	10–11 "	658
" III.	12–17 "	724

Cows in Class I. should be discarded after the first calf, unless there are any extenuating circumstances. The probability is that one in five will turn out good yielders.

Class II. offers the greatest opportunity to the skilful judge of dairy cattle. It is "odds on" that they will pay for keeping, but "odds against" that they will turn out high yielders. Cows of this class should be kept for the second calf.

Class III. may be considered as likely to do well, and should, of course, be kept. At the same time, it unfortunately appears to be less certain that cows in Class III. will be good yielders than that Class I. will do badly.

THE WALNUT.

(*Continued from page 687.*)

C. F. Cole, Orchard Supervisor.

DISEASES.

The walnut tree, in Victoria, has practically remained free from attack by larvæ of the many different species of wood borers, which do considerable damage to indigenous, as well as introduced, trees. How long this tree will remain immune time alone will show. So far the only borer recorded found slightly attacking the bole and boughs of the walnut is a very common indigenous species known as the *Cherry Borer* (*Cryptophaga unipunctata*) (*Maroga gigantella*). Of recent years insects belonging to the coccidæ family (scale), principally introduced species, have been found attacking the tree, but so far there is no record of any scale insect causing serious injury. The walnut can, therefore, be looked upon as a tree very free from insect attack likely to cause serious trouble. But there are diseases which cause injury to the developing nuts upon the trees and the dried nuts when stored. Only those diseases considered of importance will be dealt with separately under the headings of Insect, Fungus, or Bacterial Pests, as the case may be.

INSECT DISEASES.

Acknowledgment is due to Mr. C. French, junior, State Government Entomologist, who kindly assisted me with the life history and treatment of most of the insect pests recorded hereunder:—

CHERRY BORER (*Cryptophaga unipunctata*).

The larva, when full grown, is about 2 inches in length, somewhat hairy, and of a pinkish-white colour. The perfect insect (moth) is generally a silky white colour, with a black spot upon each fore-wing, hind-wings darker margined with a white fringe, antennæ black, length of body 10-12 lines, spread of wing 20-30 lines.

This grub tunnels under the bark and destroys the sap wood and cambium layer, which is its principal food. When not feeding or disturbed it usually retires into a bore or tunnel gnawed right to the pith or heart of the bough or bole. Indication of attack is indicated by sawdust-like excrescences, at times accompanied by the exudation of gum upon the surface of the outer bark. Upon examination, very often the tunnelling beneath the bark extends right around the bough. The slightest tap upon the bark, at the place of entry, causes the grub to make a hasty retreat to the extreme depth of the bore or tunnel.

Treatment.—As soon as the working of a borer is detected, clear away the sawdust-like matter or any destroyed bark. If a bough is attached and the injury is fatal carefully saw it off and burn. Wax over any wounds made by the removal of destroyed bark or boughs.

The grub may be destroyed by injecting a little carbon bisulphide into the bore or tunnel and plugging with a piece of clay or other suitable substance, or by working into the bore a piece of pliable wire. Plugging the bore with a stick dipped into a mixture of three parts tar and one part carbolic acid will kill the grub.

SAW-TOOTHED GRAIN BEETLE (*Silvanus surinamensis*, Linn.).

An introduced insect which is often found in warehouses, shops, and other places attacking stored walnuts This insect is of a dark reddish-brown colour, measuring about 1-10th of an inch in length. The thorax is deeply serrated, with six prominent teeth on each side. Both the larva and perfect insect feed upon dried walnuts.

Treatment.—Fumigate the walnuts with carbon bisulphide or hydrocyanic acid gas.

WALNUT MOTH (*Ephestia elutella*, Hubn.).

This moth deposits very minute oval, pearly-white eggs, singly or in clusters, upon walnuts or the meat of the nuts if exposed. The larvæ eat their way through the shell, usually selecting the stem end, where the shell joins.

Colour of larva dirty brown or yellowish, head brown, body covered with very light-grey-coloured hairs. General description of female moth: Head and thorax rich reddish-brown; abdomen silver-grey, changing to a rich brown; fore-wings, one-third, near the body, straw to grey in colour; remaining two-thirds of the wings, reddish-brown, with a dark band bordering on the lighter base, *i.e.*, between the red and straw colour; another dark band is situated further back and parallel to the first; two more bands extend diagonally across the tip of the wing parallel with the inner margin of the fringe, which is dark-brownish, or dark-greyish, in colour, the same as the bands.

Secondary wings, fringed; general colour, silver-grey.

This insect is fairly common in Victorian stores.

Treatment.—Fumigate with carbon bisulphide or hydrocyanic acid gas.

INDIAN MEAL MOTH (*Plodia interpunctella*).

This moth is an introduced and variable species, about the size of the codlin moth (*Carpocapsa pomonella*). The outer edges of the fore-wings have reddish-brown markings. Secondary wings, dark or light greyish in colour. The larva of this moth at times does considerable damage to stored walnuts.

Treatment.—Fumigate with carbon bisulphide or hydrocyanic acid gas.

SCALE INSECTS (*San José Scale—Aspidiotus perniciosus*).

This scale is one of the most difficult species to detect, owing to its small size and the closeness with which it sticks to the bark. Once this scale insect becomes established it is hard to dislodge. The writer's observations are that, when full grown, this scale varies somewhat in colour. When found attacking the walnut it is much lighter, resembling the colour of the bark, than when found upon the apple, pear, and other trees.

Description.—General colour, sooty-black, with a yellowish-brown spot in the centre; shape, round. With badly-infested trees the bark has a scurfy appearance, occasionally being pitted.

Treatment.—Spraying with prepared red spraying oil, emulsion at a strength of 1 part emulsion diluted in 25 parts of cold water, applied during the dormant period of the tree, or lime sulphur wash are the two most popular washes used for the suppressing of this scale pest.

GREEDY SCALE (*Aspidiotus rapax*).

This is a fairly common scale found attacking walnut trees.

Description.—General colour, greyish, raised, and usually very thickly-clustered together; about the size of San Jose scale.

Treatment.—The same as for San Jose.

During the earlier periods of the nut season of 1914-15, at Bright and the surrounding district, a grub, attacking the developing nuts upon the trees, was brought under my notice. Upon examination I found that the method of entering the nut by this grub was identical with that of the codlin moth larva attacking the apple and pear, *i.e.*, the grub eats in from the outside, but not a single nut was found bored at the stigma or blossom end. The shell of the nuts becoming hardened at the period of attack I found that this grub bored through the husk, close to the stem, and entered the meat or kernel, which is its object of attack, down through the soft portion at the stalk end, where the shell joins. Upon opening several nuts attacked it was found that the maturing meat was being freely eaten, and that the grub was, in size, shape, and colour, very like the larva of the codlin moth, but until the perfect insect emerges from specimens collected it would not be possible to say that it is the codlin moth larva.

Signs of Attack.—The husk, at place of entry, becomes blackish in colour, finally decaying around the stem, causing the developing nut to prematurely fall to the ground. Attacked early or before the shell hardens the nuts turn black with decay and quickly fall. The walnut differs from ordinary fruiting trees that can be conveniently sprayed, so as to combat insect and other pests. Owing to the size this tree attains it would be a difficult task to spray with arsenate of lead in the same manner as apple and pear trees are for the codlin moth. Although the attack by this grub is not of a serious nature, so far as the damage done last nut season to the walnut crop is concerned, yet, in the near future, it might cause serious loss. Practically all of the nuts attacked fall to the ground, and as a wise precaution it would be as well to rake or gather up all fallen walnuts and destroy them.

FUNGUS DISEASE—*Root Rot, Toadstool Disease* (*Armillaria mellea*, Vahl.).

This deadly fungus confines its attack to the roots, and that portion of the stem below the surface of the soil. The fructification of this fungus is to be observed above ground by clusters of toadstools produced around and upon the butt of the tree attacked. This fungus is an indigenous species, preying upon many forms of native trees and shrubs, and prevalent in cool, moist, timbered localities, particularly mountainous ones most suited to the growth of the walnut.

Symptoms of Attack.—The foliage becomes sickly in colour, finally falling if the attack is severe, and the terminal ends of the branches die-back. Upon removal of the soil from the roots and around the butt, the black cord-like mycelial strands of the fungus are found covering the roots and other parts like a dense felt or network. If the dead or decaying bark is removed white sheets of mycelium are to be found between the affected bark and wood.

Treatment.—Any trees affected with this disease should be grubbed up and burnt upon the spot from which the tree was removed. Before re-planting, the soil for some distance around the affected spot should be thoroughly turned over and watered with 1 lb. of sulphate of iron, dissolved in 4 to 5 gallons of water, or 1 lb. of sulphate of copper (bluestone) dissolved in 8 gallons of water. This fungus may be classified as hemi-saprophytic, *i.e.*, it lives upon dead and decaying wood as a saprophyte, and becomes purely parasitic by preying upon living tissue.

Reference is drawn to this disease in a former article on preparation of land. *Journal of Agriculture* for October, 1914, page 630.

Sunscald.—It is not unusual, in districts subject to extreme heat, to see portion of the bark upon the exposed or hot side of the trunk of walnut trees destroyed by the sun. The injured bark cracks, finally decays, and leaves a scar upon the trunk. From observations such conditions seem to be due to the want of sufficient soil moisture, there not being enough moisture to keep up a regular and active sap flow. The exposed portion becomes susceptible to sunburn, which injures the cambium and causes an exudation of sap which oxidizes when exposed to the atmosphere, the bark within the injured zone becoming blackish in colour.

Somewhat similar conditions are brought about upon the nuts when exposed to a hot sun, and the tree suffering from the want of soil moisture (see Fig. 5, *Journal of Agriculture*, August, 1914, pp. 460-1). Healthy trees growing upon suitable soil having an abundance of moisture during the hot periods seem to be free from this trouble.

(To be continued.)

STANDARD TEST COWS.

During the period fifty-four cows completed their term under the regulations. Of this number forty-two gained their certificate.

Two fresh herds have been entered for testing, viz. :—

Agricultural High School, Leongatha.—Jerseys.
Muhlebach Bros., Batesford.—Ayrshires.

Quarterly Report for Period ended 30th September, 1915.

Mrs. A. BLACK, Noorat. (Jersey.)

Completed since last report, 4. Certificated, 0.

A. BOX, Hiawatha. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Roseneath's Sylvia	3,776	9.11.14	16.11.14	273	8½	4,305	5.39	232·29	200	264¾
Roseneath Twylish	Not yet allotted	17.12.14	24.12.14	273	12¼	3,884	5.21	202·58	175	231
Roseneath Fox's Twylish	3,775	19.12.14	26.12.14	273	13	4,959	5·35	265·43	250	302½

F. CURNICK, East Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Eva	3,770	19.10.14	26.10.14	273	15½	6,216½	4·78	297·26	200	338¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gipsy Maid II. of Sparrovale	2,511	25.11.14	2.12.14	273	13½	4,916	4·40	216·12	175	246½

DEPARTMENT OF AGRICULTURE, Werribee. (Red Polls.)

Completed since last report, 6. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Britannia ..	Not yet allotted	6.10.14	13.10.14	273	16	6,889¼	3·92	268·81	200	306½
Soudana	Not yet allotted	20.11.14	27.11.14	273	15¼	4,707	4·40	207·17	175	236½
Laurel	Not yet allotted	8.12.14	15.12.14	273	13½	5,006¼	4·02	201·41	175	229¼
Ontario	Not yet allotted	18.12.14	25.12.14	273	16	4,739	4·21	199·68	175	227¾
Japana	Not yet allotted	24.12.14	31.12.14	273	19¼	6,568	3·50	229·74	200	262

A. W. JONES, Whittington. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dolly	3,754	10.12.14	17.12.14	273	18	4,936½	6.24	308·23	200	351½

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 4. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Arcadia	1,534	28.9.14	4.10.14	273	9	4,842½	5·49	265·90	250	303
Bridesmaid of Tarnpirr	2,981	2.10.14	9.10.14	273	11	4,676	4·85	226·60	175	258½
Princess of Tarnpirr	2,986	8.10.14	15.10.14	273	8	4,835	5·09	246·26	200	280½

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Brownbread ..	Not yet allotted	27.10.14	3.11.14	273	8	3,936½	6·32	248·70	175	283½
Countess Twylish	928	28.10.14	4.11.14	273	21	8,150	5·24	427·50	250	487¼
Queen Spark ..	2,533	5.12.14	12.12.14	273	11½	4,282½	6.71	287·19	250	327½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 6. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lassie III. of Banyule	3,620	18.10.14	25.10.14	273	9½	3,980*	5·01	199·36	175	227¼
Lassie	509	23.10.14	30.10.14	273	16	6,997½	5·24	366·50	250	417¾
Molly III. of Banyule	3,624	6.11.14	13.11.14	273	8	3,790	5.59	211·85	200	241½
Lassie II. ..	1,136	10.12.14	17.12.14	273	25½	8,544	4·91	419·56	250	478¼
Ettie IV... ..	2,889	16.12.14	23.12.14	273	25	8,743	4·56	398·86	250	454¾

* Ailment of udder for a short period affected yield.

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lotina (imp.) ..	1,160	30.9.14	7.10.14	227	5	6,052¼	5·16	312·19	250	356

D. SADLER, Camperdown. (Ayrshire.)

Completed since last report, 4. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Flirk of Kilmarnock	3,091	4.11.14	11.11.14	273	25	7,051	3·79	267·05	250	304½

C. E. WOOD, Frankston. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Jersey May ..	2,115	23.11.14	30.11.14	273	8¼	7,136¼	4·96	353·96	250	403½
White Bell II. ..	3,728	25.10.14	*1.12.14	273	9	3,333	5.94	198·01	175	225¾

E. N. WOOD, Caulfield. (Jersey.)

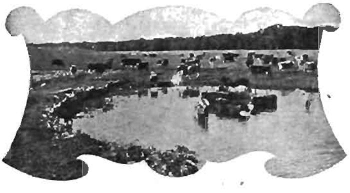
Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Luxury	3,725	7. 10. 14	14. 10. 14	273	17	8,119¾	5·40	438·83	250	500¼

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 15. Certificated, 14.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy (477) ..	Not yet allotted	25. 9. 14	2. 10. 14	273	10½	4,699½	5·14	241·83	175	275¾
Banker VI. of Melrose	3,631	26. 9. 14	3. 10. 14	273	15	5,402¼	5·64	304·76	200	347½
Jessie V. of Melrose	3,652	5. 10. 14	12. 10. 14	273	19½	7,919½	5·26	416·81	250	475¼
Edith (462) ..	Not yet allotted	10. 10. 14	17. 10. 14	273	14	5,418	5·48	296·69	175	338¼
Flower VI. of Melrose	3,641	11. 10. 14	18. 10. 14	273	13	5,274½	6·14	324·17	250	369¼
Graceful Duchess ..	Not yet allotted	14. 10. 14	21. 10. 14	273	14½	4,470¼	6·02	269·29	175	307
Quality VI. of Melrose	3,674	20. 10. 14	27. 10. 14	273	18	8,349½	5·73	478·44	250	545¼
Mystery XII. of Melrose	3,667	21. 10. 14	28. 10. 14	273	17½	6,565½	5·28	346·48	250	395
Fuchsia (468) ..	Not yet allotted	12. 11. 14	19. 11. 14	273	16½	5,503	4.51	248.39	175	283¾
Daisy V. of Melrose	3,637	20. 11. 14	27. 11. 14	273	18½	6,441	5·27	339·51	200	387
Jessie (478) ..	Not yet allotted	20. 11. 14	27. 11. 14	273	18	5,063½	5·99	303·21	175	345¾
Rarity VI. of Melrose	3,675	27. 11. 14	4. 12. 14	273	18½	8,023	5.28	423·48	250	482¾
Mystery XIII. of Melrose	3,668	2. 12. 14	9. 12. 14	273	16	6,044	6·46	390·72	200	445½
Chevy VIII. of Melrose	Not yet allotted	17. 12. 14	24. 12. 14	273	19	6,011	5·63	338·56	175	386



SHEEP DIPPING.

By A. W. Curlewis, Inspector under the Act.

Owing to drought conditions prevailing at the time of last shearing, and for some months subsequently, the Sheep Dipping Act was practically suspended in many parts of the State, and consequently the necessity for carrying out its provisions this season is greater than usual.

The great majority of sheep-owners fully realize this fact, and are anxious that the Act should be strictly enforced. There are very few, indeed, who will neglect ultimately to dip the sheep they intend to keep, but on the other hand many postpone dipping longer than is needful, and if opportunity occurs some sell undipped sheep in the meantime.

Others may dip those intended for sale in a careless, ineffectual manner, which is likely to mislead purchasers, and tends to nullify the effect of the Act more than failure to dip at all.

The result of this neglect on the part of those whom the Act holds responsible, *i.e.*, the owners of the sheep at shearing time, is easily apparent.

Subsequent owners frequently take it for granted that the sheep have already been properly dipped. Such sheep, having thrown off most of the vermin they were carrying when shorn, may not show signs of being infested with ticks or lice for some months later, when it is perhaps too late to dip them safely and effectually, and consequently they remain, until the following shearing, a source of contagion to clean sheep, and in this way the vermin is perpetuated.

The Chief Inspector has given instructions that the Act is to be carried out as strictly as possible, and owners who are neglectful in the respects indicated will only have themselves to blame if they are "brought to book."

It is freely conceded, by those who know best about the matter, that, on an all-round basis—taking one district with another—dipping enhances the productive value of sheep, in wool and general condition of sheep and lambs, to the extent of fully 2s. 6d. per head; and it follows that, on a moderate estimate, the value of universal dipping to the sheep-owners of this State may be set down at upwards of One million pounds (£1,000,000) per annum.

It would, therefore, be false economy to abstain from having the Sheep Dipping Act administered as thoroughly as may be, since it affords adequate protection to careful flock-owners.

FRUIT PROSPECTS FOR 1915-16.

By P. J. Carmody, Chief Orchard Supervisor.

Owing to thrips and drought the fruit crop of the past season was the worst on record in this State. In many districts noted for heavy fruit yields not more than 10 per cent. of a normal crop was gathered. In consequence the trees got a good rest, and now give promise of a record yield. Particularly is this the case with apples, as the reports of the Orchard Supervisors show.

At the beginning of the season, when peaches and apricots were flowering, there occurred two or three sharp frosts that affected the setting of some of these varieties where the orchards are situated in low-lying valleys that do not admit of air drainage. Unfortunately, also, the visitation of a severe hail-storm to the Ardmona district relieved growers of the major portion of the apricot crop, as well as seriously affecting that of the peach. However, in other parts of the State good crops of these varieties obtain, but, as Ardmona is at present the principal centre of apricot production in Victoria, it is to be feared that the demand will be more than can be supplied.

As large contracts for the supply of jam have been entered into with the military authorities in Great Britain, and further contracts are contemplated if the coming season's crops of jam-making fruits warrant, there should be no apprehension of unremunerative prices ruling at the jam factories. Every effort should be made by growers to foster and develop to the fullest extent the crops that are now apparent. This can only be accomplished by good cultivation, whereby the plant food of the soil will be rendered available for the support of the heavy yields, and by careful and constant attention to the different pests that menace the fruit.

Subjoined are the reports of the different Orchard Supervisors.

H. W. Davey, Orchard Supervisor, reports for season 1915-16—

BACCHUS MARSH DISTRICT.

Apples have set very heavily, and late blooming varieties, *viz.*, *Romes*, *Five* Crown, and Hoover promise heavy settings.

Pears on the whole are light, but occasionally a tree carries a big crop.

Peaches are a failure, owing to frost.

Apricots are only a light crop, owing to frost.

Plums are light, with the exception of Pond's Seedling, which are heavy.

Cherries are a light crop, excepting the late varieties, Margaret and Florence, which are heavy.

RIDDELL DISTRICT.

The chief fruit grown here is the apple, and heavy settings of leading varieties are plentiful, and the prospects of the apple crop are excellent.

Pear crop, medium to heavy.

Stone fruits, owing to frost, are light.

WERRIBEE DISTRICT.

Apples have set heavy crops, but pears are inclined to be patchy.

Apricots and plums, medium to good. Peaches, only fair. Almonds, heavy.

Prospects of fruit crop, season 1915-16, Bendigo and Northern district. S. A. Cock, Orchard Supervisor—

Bendigo	Lockwood Strathfieldsaye Sedgwick Huntly White Hills	Apples, heavy. Pears, heavy. Peaches, light. Apricots, medium. Plums, light. Quinces, heavy. Grapes, heavy. Almonds, medium. Figs, medium. Tomatoes, medium. Area planted not as large as previous years.
Castlemaine	Woodend Taradale Campbell's Creek Harcourt Sutton Grange	Apples, heavy. Pears, heavy. Peaches, light. Plums, light. Apricots, light. Gooseberries, light. Quinces, heavy. Strawberries, medium.
Swan Hill	Nyah Swan Hill Murrabit Kerang Cohuna	Apples, heavy. Pears, heavy. Apricots, heavy. Peaches, medium. Plums, medium. Almonds, medium. Figs, medium. Grapes, heavy. Tomatoes, medium. Citrus Fruits promise heavy crop.
Echuca	Echuca Bamawm Nanneella Corop	Apples, heavy. Pears, heavy. Peaches, light. Apricots, heavy. Plums, medium. Figs, medium. Almonds, medium. Grapes, heavy. Tomatoes, heavy. Area planted bigger than previous years. Citrus Fruits promise heavy crop.

Prospects of fruit crop, season 1915-16, Diamond Creek district E. Wallis, Orchard Supervisor—

The average fruit crop prospects at the following places, and their environs are as follow :—Arthur's Creek, Diamond Creek, Doreen, Eltham, Greensborough Kangaroo Ground, Keilor, Panton Hill, Queenstown, Research, and Whittlesea.

Apples.—Very heavy.

Apricots.—Medium. The crop at Keilor and at orchards situated on low lying land at Diamond Creek, &c., was badly affected by frost early in October

Cherries.—Medium.

Peaches.—Medium. Affected by frost, same as apricots.

Pears.—Medium to heavy.

Plums.—Medium to heavy.

Quinces.—Medium. Affected by frost

Prospects of fruit crops, season 1915-16, in the Doncaster district A. A. Hammond, Orchard Supervisor—

Apples.—All varieties promise a heavy crop.

Apricots.—Medium. Not largely grown.

Cherries.—Medium to light. In Doncaster cherries have only about 35 per cent. of a normal crop. In Ringwood and Croydon districts there is a medium crop.

Peaches.—Medium to good. Peaches set a heavy crop, but owing to aphis and other causes some varieties thinned out very much.

Pears.—Medium to good. Pears are very patchy. Some orchards have a heavy crop, while in others the crop is light. On the whole, there is promise of a normal crop.

Plums.—Medium. In Doncaster plums are light to medium. There is a much better crop in Ringwood and Croydon districts.

Quinces.—Good to heavy.

Prospects of fruit crop, season 1915-16, in the Evelyn district. J. Farrell, Orchard Supervisor—

Apples.—Owing to favorable weather conditions, which obtained throughout the blooming stage, all early flowering varieties, Jonathan, Yates, &c., have set a heavy crop. Late blooming kinds, London Pippin, Rome Beauty, &c., are also setting well. Black spot is not much in evidence, and, as far as can be seen at present, there will be a heavy crop of good apples.

Pears.—Williams' Bon Chretien have set a heavy crop on the older trees, but on the young ones rather light. Vicar of Winkfield mostly medium; in some localities rather light. Howell heavy. Keiffer's Hybrid heavy where conditions favour cross-fertilization, but light where cross-pollination has not been provided for. Other kinds mostly heavy.

Plums.—All varieties set well, but in many instances frost did considerable damage to the young fruit. Taking the crop on the whole it will be fairly good.

Peaches.—Brigg's Red May and Hale's Early set a good crop, but the young fruit was considerably reduced by frost. Mid-season and late kinds medium to heavy.

Apricots.—Not extensively cultivated in the district, but a fair crop is showing on the trees.

Cherries.—Almost all varieties set a heavy crop, but this has been reduced to about 25 per cent. by frost.

Quinces.—Bloomed well, but have not set as well as usual. On the whole there is a medium crop.

Citrus.—Lemons, medium to heavy. Oranges, light to medium. Other varieties, light.

Figs.—Early crop medium.

Loquats.—Medium to light.

Passion Fruit.—Plants look well, and a good crop is anticipated.

Gooseberries.—All varieties heavy.

Currants.—Medium to heavy.

Raspberries, Loganberries, and Lawtonberries.—Owing to the absence of thrip and favorable weather there is an exceptionally good crop of these fruits.

Strawberries.—Medium to heavy.

Prospects of fruit crops, season 1915-16. Gippsland district. S. Pilloud, Orchard Supervisor—

The apple crop is very heavy at Pakenham, Officer, Beaconsfield, Bunyip, Drouin, Warragul, Yarragon, Cowwarr, Darnum, Ellenbank, Bairnsdale, Bruthen, and Garfield. The Jonathans, Yates, Rokewood, Statesman, Rymer, and other varieties have set very heavily. The Rome Beauty and Londons are in bloom; if they set there will be a heavy crop. Pears are very heavy in all these places Apricots have a splendid crop where grown. Peaches are very heavy at Drouin, Cowwarr, Bairnsdale, and Bruthen. Plums, a good crop in all places visited. Cherries, good crop at Cowwarr; other places light. Every kind looks well and very free from disease.

Prospects of fruit crop, season 1915-16, Goulburn Valley district. G. M. Fletcher, Orchard Supervisor—

Apricots.—Kyabram, Lancaster, Merrigum, and Tatura districts—Moor Park, light and patchy; Royals, Ouillin's, good. Ardmona, failure. Shepparton, good in all varieties except Moor Park.

Peaches.—Brigg's Red May, Sneed, Hale's, and High's Early Canada are light in all districts. Palmerstons, Crawfords, Muir, Elberta, and the late Clings are good all round, although Pullars are lighter than usual in some orchards.

Pears.—Josephine and Williams' set very heavily, but a great number are at present falling, and it is probable that the crop will be a little lighter than last year. Williams' in Ardmona will be medium.

Peaches and Plums.—Ardmona, light to medium. Other districts, good.

Apples.—Blossomed well, and promises heavy crop.

Figs.—Promising well.

SUMMARY.—All varieties in Ardmona were very seriously damaged by a heavy hail-storm on 12th October, which practically wiped out the apricot crop. Only the south-west corner of the settlement was missed, and these crops are very fair. A frost, a week before the hail, also helped to damage the peach crop. In the rest of the Valley all varieties promise well, except Moor Park apricots. The blossoming this spring was very heavy, and extended over a much longer period than usual. A good setting of prunes in all districts except Ardmona resulted, particularly in Angelina Burdetts.

Prospects of fruit crop, season 1915-16, Maryborough district. W. P. Chalmers, Orchard Supervisor—

ARARAT AND STAWELL.

Apples, heavy. Plums, medium. Pears—Williams' Bon Chretien, light; Napoleon, heavy; others, medium. Cherries, light. Grapes, good. Apricots, medium.

HORSHAM.

Apricots—Ouillin's, medium; other varieties, light. Peaches—early varieties, good; late varieties, heavy. Plums, heavy. Pears—Williams' Bon Chretien, light; others, heavy. Apples, heavy.

AMPHITHEATRE.

Apples, heavy. Pears—Williams' Bon Chretien, light; others, medium.

DUNOLLY AND BET BET.

Apples, heavy. Apricots, medium. Plums, medium. Pears—Williams' Bon Chretien, very light; others medium. Cherries—early, light; others, medium. Quinces, heavy. Grapes, medium. Peaches—early, medium; late, heavy.

Prospects of fruit crops, season 1915-16, Mildura district. G. H. B. Davidson, Orchard Supervisor—

Citrus.—Trees not affected with salt water showing good crops. There are a considerable number that will not bear this season through this cause; these are gradually coming round, although there is a great deal of dead wood in the trees.

Pears.—Not as heavy as last year, being patchy in setting; some with good crops and others light.

Apricots.—Heavy, both in Mildura and Merbein.

Peaches.—Like the pears, are patchy; some good crops and others light. Merbein light. Elbertas cast their buds.

Plums.—Good.

Figs.—Good.

Walnuts.—Not many grown.

Apples.—Not many grown.

Almonds.—Good.

The fruit suffered very much from a severe wind storm, many peaches and [illegible] badly.

Prospects of fruit crops, season 1915-16, in the Mornington Peninsula. E. Meeking, Orchard Supervisor—

Apples.—Throughout the whole of the Mornington Peninsula there promises to be a record crop of all varieties, especially Jonathans, heavier even than last season, which was the heaviest for many years. (The immunity from frosts severe enough to be harmful, which this favored district enjoys, is, I feel certain, the chief cause of the consistently good crops of fruit.)

Pears.—Being the "off" season in this district for most varieties, particularly Williams' Bon Chretien, the crop generally promises to be from fair to medium. The usually shy-bearing varieties—such as Keiffer's Hybrid, Gansell's Bergamot, Winter Nelis, Josephine de Malines—where effectively interpollinated and properly pruned, have set very well.

Apricots.—Throughout the whole district this crop promises to be particularly heavy, with the exception, perhaps, of the Oullin's Early Peach variety, fortunately not extensively grown.

Plums.—Being the "off" season, the crop is generally light, except in a few instances where interpollination has been properly carried out and scientific pruning done. In these cases the crop is normally heavy.

Cherries.—Very few grown except in the Red Hill district, where the crop is consistently heavy.

Peaches.—Grown to any extent only at Narre Warren, where the crop is from medium to heavy.

Strawberries.—Confined almost solely to Red Hill and surrounding district. The first crop (from medium to heavy) is being gathered. There is a good prospect for the succeeding crops.

SUMMARY.—Taken altogether the prospects for the present season of the fruit crop generally were never brighter, and, given a normal summer, the yield should be a record one.

Prospects of fruit crops, season 1915-16, Wangaratta and North-Eastern districts. C. F. Cole, Orchard Supervisor—

Oranges and Lemons.—Heavy blooming following the drought conditions, and promise a heavy crop.

Peaches, Apricots, and Plums.—Heavy, medium to light, Yackandandah and Wangaratta districts. Peaches and plums, including prunes, promise a heavy crop.

Almonds.—Good crop.

Cherries.—Good crop.

Pears.—Medium to light in most districts.

Apples.—Medium to heavy. Light in Jonathans Yackandandah district.

Figs.—Medium to heavy.

Loquats.—Medium to light.

Quinces.—Promises to be heavy.

Strawberries.—Good.

Prospects of fruit crops, season 1915-16, Western District. A. J. McCalman, Orchard Supervisor—

GEELONG DISTRICT.

Apricots.—Set heavy crops, but about Batesford have been thinned out very much by frosts. On the whole, the crop will be good. The principal varieties are Moor Park, Turkey, Mansfield Seedling, and Hemskirk.

Apples.—Nearly all varieties are setting heavy crops, Jonathan looking especially well. Cleopatra, Reinette de Canada, Stone Pippin, Rokewood, Dunn's Favourite (Munro), promise good yields. Rome Beauty and London Pippin show abundant bloom.

Pears.—Williams', Beurre de Capiaumont, Vicar of Winkfield, and Black Achan promise good yields. Other varieties mostly light.

Plums.—Black Diamond, Angelina Burdett, Early Orleans, and Gentleman Plum have set heavily. Some varieties are light, and damage has been done by frost in places. The crop will be fairly good.

Cherries.—Early varieties are rather light. Late varieties good.

Peaches.—These will be fairly good. Early varieties are mostly grown.

Gooseberries.—A good crop.

COLAC AND WARNCOORT DISTRICT.

Apples.—These promise an abundant crop. Rokewood, Jonathan, Sturmer, Æsopus Spitzenburg, Statesman, and Rome Beauty all look well.

Pears.—Williams' are fair. Keiffer's heavy.

Apricot.—A good crop.

ROKEWOOD DISTRICT.

Apples.—Rokewood, Jonathan, Stewart's Seedling, King David, Ben Davis, Rome Beauty, and London Pippin promise heavy yields.

Pears.—Promise of a good crop. Williams', Keiffer's Hybrid, Beurre Clairgeau, and Josephine have set well.

Apricots.—Promise of a medium crop.

MOUNT COLE DISTRICT.

Apples.—Jonathan, Rokewood, Dunn's Favourite (Munro), Reinette de Canada, Stone Pippin, Sturmer, Rome Beauty, and Golden Nob promise heavy yields. Other sorts medium.

Pears.—Williams', very light. Josephine, Vicar of Winkfield, and Winter Nelis, light.

Plums.—Both dark and light coloured varieties show a medium crop.

Japanese Plums.—Very light.

Apricots.—A failure; were destroyed by frost.

Cherries.—Early sorts light. Later kinds a medium crop.

Black and Red Currants.—Light.

Raspberries.—Light.

PORTLAND DISTRICT.

Apples.—Promise of heavy yields. Jonathan, Dunn's Favourite, Gravenstein, Cleopatra, Stone Pippin, Sturmer, Stewart's Seedling, Rokewood, Rome Beauty, and Cox's Orange Pippin all promise well.

Pears.—Promise of a heavy yield. The principal varieties are Williams' Beurre Bosc, Beurre Clairgeau, Beurre de Capiaumont, Vicar of Winkfield, Black Achan, and Josephine de Malines.

Stone fruits promise heavy yields, but are not largely grown.

PANMURE DISTRICT.

Pears.—Gansell's Bergamot and Josephine de Malines did not bloom well Williams', Beurre de Capiaumont, and Vicar of Winkfield promise well.

Apples.—All varieties are setting heavily.

Cherries.—The crop is heavy.

Apricots.—Not many grown, but heaviest crop for some years.

Peaches.—Heavy.

Gooseberries.—Heavy.

SUMMARY.—Apples, heavy. Apricots, good. Pears, fair. Cherries, good. Plums, good. Japanese Plums, light. Peaches, fair, Gooseberries, heavy.

A DISINFECTANT WHITEWASH.

The following wash is applicable for both outside and inside use. Take ½ bushel unslaked lime, slake with boiling water, and cover to keep in steam. When cool, strain through a fine sieve. Add one peck of common salt, with enough warm water to dissolve it, 3 lbs. ground rice boiled to a thin paste and stirred in while hot, ½ lb. Spanish whiting, and 1 lb. glue previously dissolved by soaking in cold water and then melted in a water bath. Then add 5 gallons of warm water (in which a pint of pure carbolic acid per gallon has been added, if for inside work), and allow it to stand a few days before using, well covered from dust. Before applying it, as much as possible of the old limewash should

THE INFLUENCE OF NITRATES ON THE DEVELOPMENT OF ROOT TUBERCLES.

By Alfred J. Ewart, D.Sc., Ph.D., Government Botanist of Victoria and Professor of Botany and Plant Physiology in the Melbourne University.

It has frequently been stated that the addition of soluble nitrates to the soil by a kind of compensatory action decreases the formation of root tubercles in Leguminosæ. In that case such plants would be obtaining their nitrogen from an expensive source of supply (*nitrates*) instead of from an inexpensive source, viz., the air. To test this statement, experiments were carried out with broad beans (*Vicia faba*). Six plots were used, in three of which the beans were planted in double rows 4 inches wide, as commonly used in gardens, while in the other three they were planted in single rows, so as to cover the same area of ground in each plot. The same number of beans were planted in each plot at lateral distances of 6 inches. Two of the plots received a dressing of potassium nitrate at the rate of 1 cwt. per acre. Two other plots received sodium nitrate at the rate of 95 lbs. per acre, which represented an equivalent amount of nitrate as such. The remaining two plots were the controls. The beans were harvested when flowering was over, being cut close to the ground and weighed immediately. The yields are given in the following table:—

Broad Beans yield in tons per acre.	Sodium Nitrate, 95 lbs. per acre.	Potassium Nitrate, 1 cwt. per acre.	*Controls.*	Totals.
Double rows	5 tons per acre	6·6 tons per acre	6·8 tons per acre	18·4 tons
Single rows	7·5 tons per acre	7·3 tons per acre	5·9 tons per acre	20·7 tons
Totals	12·5 tons per acre	13·9 tons per acre	12·7 tons per acre	—

Owing to the heavy rainfall, the double row sodium nitrate plot became somewhat water-logged, and showed delayed germination, and this is probably the chief cause for the low yield on that plot. Allowing for this, the total yields given with the double-row planting, and the single-row planting would differ very little, if at all, within the limits of error. The total yield with potassium nitrate is slightly greater than that of the control, but since it is also greater than the total with sodium nitrate, this might fairly be put down rather to the influence of the potassium than of the nitrate.

Root-tubercles were abundant on all the plots. There was no evidence of any suppression of root-tubercle formation by potassium

nitrate or by sodium nitrate in the quantities applied. The largest root-tubercle was found on a plant from the control plots, but there was no generally greater abundance, or size of the root-tubercles in the plants of the control plots as compared with the others.

Hence, although the nitrates used did not diminish appreciably the formation of root-tubercles, their use as manures in the case in question would have been highly unprofitable, the plants being able to gain all the nitrogen they required through their root tubercles and from supplies already present in the soil.

ANGORA GOATS AND MOHAIR GROWING.

The following are extracts from an article submitted by Alva L. McDonald, secretary, American Angora Goat Breeders' Association, entitled "The Importance of the Angora Goat Mohair Industry to the United States."—Editor.

The word "Mohair" is the technical name for the fleece of the Angora goat. According to George Fayette Thompson, M.S., author of the work entitled "Angora Goat Raising and Milch Goats," the word comes to us through the old French "Mohere" from the Arabic "Mukhayyar," meaning mohair cloth. It differs from the wool of sheep in that it does not have the felting properties of the latter. The felting property of wool is due to the presence of scales or epithelia, which cover the fibre in much the same manner that scales cover fish. It is the felting property of wool which distinguishes it principally from other animal fibres. Mohair is a hair proper, being devoid of scales, and so it is not successfully used alone in felt goods.

As a conservative estimate the average price for mohair is around 30 cents. per pound (15 pence), therefore the average clip per head should be from 1 to 1½ dollar (4s. 2d. to 6s. 3d.).

Mohair is used for linings, ladies' dress goods, braids of all kinds, worsted goods, alpacas, silicians, imitation furs, portiers, rugs, carpets, and novelties. Every traveller in the United States has enjoyed the comforts of a luxurious seat from mohair. The red and green plush in every railroad coach, so familiar to Americans, is made from mohair. Again, the beautiful wigs, puffs, switches, displayed in the shop windows of our leading coiffeurs, are products of the Angora. A later use for mohair has been found in the manufacture of automobile goods alone. There is one mill in the East which annually turns out mohair goods to the value of from 10 to 12 million dollars (approximately £2,000,000 to £2,500,000). This is only one, and there are some ten or twelve mills engaged almost exclusively in the manufacture of mohair goods. Angora raising can be carried on by two classes of farmers and stock growers. The first is the small farmer who has some brushy waste lands on his farm which is an utter loss to him—places where grass does not grow, consequently such lands are of no value for his cows or his sheep, brush and weeds having taken possession. It is here the Angora will prove its worth. Its natural bent is to browse, while, peculiar as it may

an well

afford to keep a few Angoras, if for no other purpose than to clean up these waste places. Their value in this would be worth their keep, but in addition to this, they will yield a clip of mohair worth at least 1 dollar (4s. 2d.) per head, but more likely worth 1½ dollar (6s. 3d.).

The second class is the owner of a large tract of waste lands, who can utilize Angoras by putting them on the foothills and mountainous country found in every State in the Union, their natural tendency to browse and their adaptability to mountainous or steep and rocky country opens an avenue for using these tracts for which heretofore no use has been found.

The brush and weeds which cattle overlook are the Angoras' principle article of food, consequently a remarkable change is apparent. The grass follows the Angora. This is because the Angora destroys the brush and weeds, giving an opportunity for the grass to grow. Hence it follows that when the stock growers have realized handsome profits from the sale of their mohair, they have also improved their range.

Stock-owners having awakened to this fact, have gone extensively into the Angora goat business, which accounts for the fact that they are now found in every State in the Union, and the demand for Angoras at this time is unprecedented.

The States bordering on the Atlantic coast are each represented by hundreds of small bands, where they are used for the dual purpose of clearing up the waste lands and for the growing of mohair, while the industry has shown a remarkable growth on the Pacific slope, and where it appears the growth will be still more remarkable in the future.

PASTEURIZATION OF WHEY.

For many years past it has been the custom of a large number of the cheese factories to pasteurize the whey before returning it to the milk suppliers, with the result that this by-product reached the farm in a very much better condition than formerly. It was also found that the stock to which it was fed thrived much better than upon unpasteurized whey, and the farmers were almost unanimous in the opinion that its value was increased. Moreover, when the whey was pasteurized, the surroundings of the whey tank at the factory were free from objectionable smells—everything, in fact, appeared to be in favour of a continuance of this practice.

During the last year or two, since the skimming of the whey for butter-making became more general, a number of the dairy factories has discontinued to treat whey in this manner. The reason advanced—that the whey was so reduced in value that it was not worth the expenditure for heating—is quite a mistake, and dairy companies would be acting in the best interests of the farmers if they would insist upon the whey being pasteurized.—D. CUDDIE, in *Journal of Agriculture*, New Zealand.

BAYONET GRASS (*Aciphylla Colensoi*).

In the July issue of the *Journal* was published (page 413) a note by Mr. Temple A. J. Smith, Chief Field Officer of the Department, on "Bayonet Grass," and its usefulness in feeding starving stock in the Benalla district.

The Chemist for Agriculture (Mr. P. R. Scott) now submits the analysis of Bayonet grass as compared with Kangaroo and Wallaby grasses. It will be seen that it compares favorably with either, and explains its value during the present drought.

ANALYSIS OF EDIBLE PORTION OF BAYONET GRASS (*Aciphylla Colensoi*).
Submitted by Temple A. J. Smith.

The sample on analysis was found to contain—

	Original.	On Dry Basis.
Moisture	48.33%	..
Ash	2.96%	5.73%
Protein	3.29%	6.37%
Crude fibre	13.93%	26.95%
Nitrogen free extract	29.47%	57.04%
Ether extract	2.02%	3.91%

The material used for analysis was that portion of the plant commonly known as the butt, the green portion being discarded, firstly, because stock do not, as a rule, eat it; and secondly, because the sharp edges of the grass irritate the mucous membrane and lessen the process whereby the food is partly built into living tissue and partly voided, as excrement. As an analysis of a food does not convey more than the composition as determined by splitting up into its component parts, it may be as well, therefore, to compare these returns with two well-known highly nutritious native grasses, Kangaroo and Wallaby:—

	Moisture.	Ash.	Protein.	Crude Fibre.	Nitrogen Free Extract.	Ether Extract.
Bayonet	48.33%	2.96%	3.29%	13.93%	29.47%	2.02%
Kangaroo	48.30%	2.73%	2.19%	16.09%	29.34%	1.35%
Wallaby	56.40%	3.67%	4.63%	11.82%	21.87%	1.61%

Comparing these analyses, it may be observed that the edible portion of the Bayonet grass is very similar in composition to the coarser of the two grasses used—the Kangaroo; it may therefore be considered, for all practical purposes, to be of equal value as a food, all other things being equal. Again, from a commercial point, the value of each of these grasses may be arrived at approximately by considering the protein and ether extract, to be two and one-half times as valuable as the nitrogen free extract. The sum total of these ingredients, so calculated, will return the feed units. They are as follows:—

Bayonet.	Kangaroo.	Wallaby.
42.7	38.2	37.5

If we base our calculations of the value of this feed according to the feed unit as arrived at by analysis, the bayonet grass butt is of slightly better feeding value to both Kangaroo and Wallaby grasses; this result is interesting, and helps to account for stock thriving on this food when pressed through stress of circumstances.

As a stand-by, it evidently is of some value, in times of drought as a food for starving stock; as a plant worthy of cultivation, it does not warrant any consideration.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluding 14th April, 1916.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.10.15	Totals. 15.10.15 to 14.11.15	Totals. Seven months.	Position in Competition.
		LIGHT BREEDS. WET MASH.				
38	White Leghorns ..	G. McDonnell	802	167	969	1
2	,, ..	E. A. Lawson	793	159	952	2
34	,, ..	H. McKenzie and Son ..	779	172	951	3
21	,, ..	E. B. Harris	803	136	939	4
19	,, ..	L. G. Broadbent ..	786	152	938	5
42	,, ..	W. M. Bayles	761	169	930	6
53	,, ..	W. G. Swift	794	128	922	7
8	,, ..	C. J. Jackson	761	155	916	} 8
5	,, ..	J. J. West	774	142	916	}
7	,, ..	Marville Poultry Farm ..	736	155	891	10
9	,, ..	J. Schwabb	738	146	884	11
6	,, ..	F. Doldissen	730	150	880	12
26	,, ..	A. Mowatt	720	144	864	13
10	,, ..	A. E. Tuttleby	730	130	860	14
39	,, ..	W. M. Sewell	699	157	856	15
30	,, ..	A. E. Silbereisen ..	703	152	855	16
16	,, ..	N. Burston	713	135	848	17
4	,, ..	R. Hay	700	144	844	18
44	,, ..	Mrs. F. M. Oliver ..	717	118	835	19
3	,, ..	J. H. Gill	681	153	834	20
23	,, ..	Fulham Park	669	164	833	21
11	,, ..	J. B. Brigden	676	154	830	22
1	,, ..	Mrs. H. Stevenson ..	690	138	828	} 23
28	,, ..	R. Lethbridge	669	159	828	}
59	,, ..	W. G. Osburne	674	155	829	25
32	,, ..	F. Hodges	694	133	827	26
50	,, ..	John Hood	683	142	825	27
54	,, ..	W. G. Clingin	679	144	823	28
13	,, ..	T. Hustler	663	157	820	29
49	,, ..	Bennett and Chapman ..	670	146	816	30
18	,, ..	D. Adams	688	127	815	31
24	,, ..	Lysbeth Poultry Farm ..	662	148	810	32
25	,, (5 birds)	Giddy and Son	667	133	800	33
60	,, ..	H. C. Brock	674	122	796	34
33	,, (5 birds)	A. W. Hall	647	132	779	} 35
15	,, ..	H. N. H. Mirams ..	634	145	779	}
55	,, ..	W. N. O'Mullane ..	633	142	775	37
20	,, ..	R. W. Pope	615	157	772	38
48	,, ..	C. J. Beatty	627	134	761	39
27	,, ..	J. A. Stahl	606	154	760	40
43	,, ..	H. I. Merrick	603	153	756	} 41
47	,, ..	J. C. Armstrong ..	606	150	756	}
58	,, ..	Thirkell and Smith ..	588	154	742	43
12	,, ..	G. Hayman	591	141	732	44
22	,, ..	S. Buscumb	580	149	729	} 45
36	,, ..	Weldon Poultry Yards ..	573	156	729	}
41	,, ..	J. A. Donaldson ..	579	142	721	47
45	,, ..	South Yan Yean Poultry Farm	574	139	713	48
46	,, ..	R. Berry	577	134	711	49
52	,, ..	A. A. Sandland	589	119	708	50
57	,, ..	B. Mitchell	589	118	707	51
40	,, ..	C. C. Dunn	560	131	691	52
37	,, ..	A. Ross	525	128	653	53
14	,, ..	W. Flood	495	137	632	54
56	,, (5 birds)	G. Hurst	479	114	593	55
31	,, ..	L. McLean	455	129	584	56
		Total	37,103	8,044	45,147	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.10.15	Totals. 15.10.15 to 14.11.15	Totals. Seven months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	865	148	1,013	1
68	" ..	B. McKenzie and Son ..	740	160	900	2
79	" ..	Lysbeth Poultry Farm ..	692	153	845	3
64	" ..	W. M. Bayles	697	142	839	4
69	" ..	E. MacBrown	693	144	837	5
66	" ..	E. A. Lawson	666	149	815	6
63	" ..	A. H. Padman	662	152	814	7
76	" ..	A. A. Sandland	652	161	813	8
78	" ..	H. Hanbury	687	124	811	9
72	" ..	Mrs. E. Zimmermann ..	661	129	790	10
62	" ..	Benwerren Egg Farm ..	623	166	789	11
61	" ..	Mrs. H. Stevenson ..	622	162	784	12
65	" ..	Thirkell and Smith ..	619	151	770	13
67	" ..	C. C. Dunn	595	151	746	14
71	" ..	Moritz Bros.	592	153	745	15
73	" ..	C. L. Lindrea	503	168	671	16
77	" ..	South Yan Yean Poultry Farm	509	144	653	17
74	" ..	J. H. Gill	464	123	587	18
75	" (5 birds)	Fulham Park	451	113	564	19
		Total	11,993	2,793	14,786	
		HEAVY BREEDS.				
		WET MASH.				
86	Black Orpingtons ..	C. E. Graham	801	140	941	1
97	" ..	Marville Poultry Farm ..	805	114	919	2
81	" ..	Mrs. T. W. Pearce ..	769	107	876	3
100	" (5 birds)	J. H. Wright	776	93	869	4
85	" ..	H. H. Pump	715	131	846	5
89	Rhode Island Reds	E. W. Hippe	693	139	832	6
93	Black Orpingtons ..	L. W. Parker	685	137	822	7
88	" ..	J. McAllan	690	127	817	8
90	" (5 birds)	Oaklands Poultry Farm ..	688	99	787	9
87	" ..	W. C. Spencer	641	138	779	10
91	" ..	A. Greenhalgh	636	137	773	11
92	" ..	J. Ogden	609	158	767	12
99	" ..	L. McLean	644	120	764	13
84	" ..	Cowan Bros.	614	135	749	14
94	" (5 birds)	D. Fisher	663	78	741	15
95	Silver Wyandottes ..	W. H. Forsyth	583	106	689	16
98	Faverolles ..	K. Courtenay	510	132	642	17
83	Black Orpingtons ..	G. Mayberry	510	110	620	18
96	White Orpingtons ..	Stranks Bros.	510	36	546	19
82	White Wyandottes	J. B. Brigden	342	118	460	20
		Total	12,884	2,355	15,239	

Report for the month ending 14th November, 1915.

The weather conditions for the month were very changeable. There was much heavy wind. Temperatures ranged from 42 degrees F. to 93 degrees F. in the shade. The health of the birds was good. Broodies were very plentiful. The egg yield for the month was good. The rainfall was 230 points.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

CARE OF YOUNG TREES.

The care of the young tree at this season of the year is one of the most important of orchard operations. A very considerable number of young trees have been planted out during the past planting season, and it is thought advisable to draw attention to this. Whatever care and attention are given to young trees will be amply repaid to the grower in after years, owing to the vigour, sturdiness, and other qualities imparted to them. It is a mistake to plant a young orchard, and, after cutting back the trees, to leave them practically to their own devices, other than following the usual methods of soil cultivation.

The trees, after the early summer cultivation and cleaning of the soil, should be mulched with straw, grass, or leafage of some description. This mulching should not be crowded around the stem, its object being mainly to create moist and cool soil conditions, and to encourage a free root establishment. The mulch material should be occasionally stirred, and no weed or grass growth should be allowed to accumulate amongst it. Where mulching material is not available, a very frequent earth mulch should be given, by constantly stirring the soil within a few feet of the trees. In addition to mulching, it will be beneficial to spray the young trees with water wherever possible, particularly on hot and windy days. At such times, the transpiration of moisture from the foliage is very excessive and continuous, and a water spray is thus very helpful to the young trees.

Further, all unnecessary buds should be rubbed off, particularly on the main trunk; and all growths in the centre should be pinched back, so as to force as much sap as possible into the growths which will ultimately form the framework of the tree. Similar attention should also be given to grafted trees; although they may not need mulching to the extent that the young trees do, yet the water syringings and disbudding work will be of great benefit to them.

CULTIVATION.

All orchard soils should be kept well worked during the summer months. It is very essential that these should have an abundant supply of moisture during the whole of the growing season. The transpiration from fruit and foliage is considerable at any time, but during hot and windy weather the amount of moisture which is required by a tree, and which is ultimately transpired from the tree, is very exceptional.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to retain or obtain sufficient for their nourishment; they then very soon wither and die. The soil around these should be kept well stirred; they should also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to keep up a good loose earth mulch during the whole season, and to keep down all the weeds and useless orchard growths.

PRUNING.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree, and to increase the development of new fruit buds.

SPRAYING.

Spraying with arsenate of lead for various pests will now be receiving attention. These include the codlin moth, cherry slug, root borer, looper caterpillar and various leaf-eating insects.

Cherry trees should be watched for visitations of the pear and cherry slug. As soon as this insect appears, the trees should be sprayed with hellebore or tobacco water. If there is no fruit on the trees, arsenate of lead should be used as a spray. The slug should not be allowed to defoliate the tree after the fruit has been picked. Loss of leaves at any season is weakening and injurious to the trees.

Vegetable Garden.

All weeds must be hoed out from the beds, and if these are at all abundant, they may be dug in as green manure, or they may be used for mulching the tomato, melon, marrow, or such plants. Tomato plants should be staked, and all lateral growths pinched out; they should now be well manured and well watered. If not manured, a good liquid watering once a week with liquid manure is necessary.

Asparagus beds should be allowed to mature their growths, and all cutting should now cease. A top dressing of manure will be helpful to the crowns.

Potato and onion beds will require constant hoeing, and it may be helpful to break down the tops of the onions, so as to prevent a too vigorous growth of the top, for the formation of flower buds and thus strengthen and increase the value of the bulbs.

The long runners and weak lateral growths of plants of the melon family should be pinched back, and liberal supplies of water should be given.

French beans, peas, lettuce, cabbage, cauliflower, &c., should now be sown, the beds being made moist and cool for the planting.

Flower Garden.

Plant out dahlias this month: tubers early, and plants grown from cuttings for exhibition blooms later in the month. Water the soil well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers, so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored; while gladioli corms may still be planted.

The garden must be kept well watered and well cultivated, so as to tide the plants over the hot and dry season.

Sugar Beet grown last season in the Maffra district, weight 28 lbs.

INDEX OF VOLUME XIII.

The Index of Vol. XIII. will be supplied with the first number of Vol. XIV., viz., 10th January, 1916.

REMINDERS FOR JANUARY.

Live Stock.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares should be well fed on succulent food if available; otherwise,* oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

Pigs.—Supply short bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now. Plenty of water should be available for them to wallow in in hot weather.

Sheep.—Ewes will come in season this year well to time. Merino and fine Comebacks, November and December. Crossbreds, January and February. Pure British breeds, March. Have ample rams running with them. Make sure of every ewe possible being in lamb. Two-tooth ewes, if well grown, can be bred from, but they should be well treated throughout. Use rams with width and substance, and never inferior fleeced ones. Rams work best at night, and with large paddocks it may be necessary to yard occasionally, in any case, in a season like this, yarding will help to keep ewes from excessive condition. Unhealthy discharge from sheep attracts flies, a purgative drench or pills should be used in such cases.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

Cultivation.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against *codlin moth, pear slug, vine caterpillar,* and woolly aphis. *Summer prune* strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabbi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—Summer butt or *Yema* grafting may be practised in January, though February is the usual month. This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of odium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

Australian Wheat Harvesting Scheme

: : The Necessity for : : Government Intervention

Issued by the Hon. the Minister
:: :: of Agriculture, Victoria, :: ::
Hon. F. W. HAGELTHORN, M.L.C.

By Authority:
ALBERT J. MULLETT, GOVERNMENT PRINTER, MELBOURNE.

[Supplement to the *Journal of Agriculture*, Victoria, December, 1915.]

AUSTRALIAN WHEAT HARVESTING SCHEME.

(*Issued by the Hon. the Minister of Agriculture, Victoria, Hon. F. W. Hagelthorn, M.L.C.*)

GOVERNMENT WHEAT SCHEME.

It is only natural that farmers should be keenly interested in the Government wheat marketing scheme. They want to know all about it. Some cannot understand why the Federal and State Governments should interfere at all. "Why not leave us alone?" they ask. They see wheat bringing a high price, higher than for many years; they have a record crop. "Why cannot the Government leave us alone? Wheat is worth 7s. a bushel in London; why should we, who suffered from a drought last year, not be allowed to take full advantage of our bumper harvest and high prices? We can sell our wheat without Government interference." Other farmers, while admitting that Government interference may be necessary, do not approve of the scheme. They consider the marketing charges too high; the amount advanced too small; the arrangements for control unsatisfactory. The object of this pamphlet is to explain the reason for Government interference, to show how the scheme will affect the farmer, and to answer the various criticisms directed against the scheme.

WHY THE GOVERNMENT HAVE STEPPED IN.

The reason why the Governments have stepped in is to save the farmers and the community generally from disaster. The circumstances not only justify the Government's action, but imperatively demand it. These are no ordinary times. The greatest war the world has ever seen is raging; the Empire is fighting for its life, and so are we. The war dominates everything—its effects are far-reaching, extraordinary, unexpected. The Federal and State Governments have interfered—not to prevent the farmer getting the benefit of high prices, but **to save him from ruin and the country from chaos and disaster.** The effects of the war manifest themselves in most unexpected ways. The war is the cause of the wheat problem. It is also the cause of high prices. If there were no war, farmers would have no difficulty in marketing their produce in the usual way. But if there were no war, prices would be much lower.

The war, which has made the Australian farmers' wheat much more valuable abroad, has also made the task of marketing the crop extremely difficult and costly. The farmer looks upon paddocks of waving wheat, ripening in the sun, stretching as far as the eye can see. It is a sight to fill the heart of man with great gladness; but it does not complete the picture. Before this bounteous harvest can be turned into money, it must be transported to the markets of the world. The farmer must face the position as it is, not as he would like it to be. It will not do for him to fix his eyes upon high prices in London and ignore the fact that these **high prices mean little or nothing to him unless he can get his wheat to Europe.** He must look at the whole position in exactly the same way as if he were 100 miles from a railway, with very bad roads thereto, the teamsters *demanding exorbitant prices, and not* enough *teams in* any case to cart half the produce in his district to market. What a mockery high prices would be to the farmer in such circumstances. But that is exactly the position to-day.

THE KEY OF THE SITUATION.

The key of the situation is freight. This war has, through one cause or another, put out of action—sunk, locked up, or diverted for war purposes—nearly half the world's shipping. Naturally ship-owners are able to obtain high freights. In normal years freights from Australia to the United Kingdom have ranged between 25s. and 35s. To-day they are quoted at 95s. to 110s.—that is to say, they have increased nearly 250 per cent. Put in other words, the cost of transporting a bushel of wheat from Australia to the United Kingdom is (including insurance) about 3s., or more than the farmer for many years actually received for his wheat. The present situation is abnormal—it is indeed unique. Methods suited to ordinary times are useless now. Means of dealing with the situation—adequate, equitable, practically and financially sound —had to be devised, and it is submitted that the Government scheme complies with these requirements.

GOVERNMENT CONTROL OF WHEAT.
FREIGHT SCHEME USELESS WITHOUT.

Without this scheme, the arrangements made by the Federal and State Governments, whereby the Commonwealth was made the only charterer of vessels for carrying the wheat crop to market, would be incomplete. Just as without Government control of freight, Government control of wheat would be of no avail. Both are essential to meet the extraordinary conditions created by the war. The salutary effects of the control of freight by the Federal Government are obvious. By this arrangement all competition for Australian wheat freights was eliminated. *Instead of there being a number of competitors bidding*

against one another, and so running freights up, there has been but one buyer. **As a result, farmers are at this moment getting freight at from 10s. to 20s. a ton less than would otherwise have been the case. And, what is of much greater importance, they are getting freight which by no other means could they have got at any price.**

HIGH PRICES FOR WHEAT MEAN NOTHING TO THE FARMER WITHOUT FREIGHT.

And this is the crux of the position. The great trouble is not so much that freights are high, but that **freight is extremely difficult to obtain at any price.** All would be well if it were possible to obtain sufficient freight to transport our wheat to market while high prices ruled. But this is the great problem. **Never did we require so much freight—never was there less to be got.** It is estimated that the amount of this season's wheat available for export will be somewhere between **2½ million to 3 million tons.** The greatest amount ever exported in any previous year was 1¼ million tons in 1913-14. In a perfectly normal year, when all the world's supply of shipping was available, the business of getting twice as much wheat to Europe as was *ever previously handled* would have been very difficult. *It took six* months—from January to June—to send away the 1913-14 crop with freights normal and all the world's shipping eagerly seeking employment. It would have taken from nine to twelve months to send twice as much. But with only half the world's shipping available, and every country in the world frantically endeavouring to secure it for itself, how long is it going to take to send away over twice the quantity of wheat? No one can tell.

WAR AND FREIGHT.

SUBMARINES—ADMIRALTY REQUISITIONS.

When this war is going to end no one can say, but in all human probability it will last another year at least. Every day it is playing havoc with the world's shipping. Every day submarines or mines of the enemy are sending good ships to the bottom of the sea. Every day the British Admiralty and the Allies are requisitioning more shipping. These facts are pregnant with great meaning. **Even when freight is chartered, no one can say definitely—as in normal times—that so much freight will be available; it may be sunk; it may be requisitioned.** The most one can say is that we hope that it will be available. But, apart from what is wanted for local consumption, who could buy wheat from the farmer under such circumstances? **No private buyer could afford to do so. He must have the ship to fill before he will buy the wheat to fill**

it with. It was this position which the Governments of the Commonwealth and the States felt themselves compelled to deal with in a bold, comprehensive, and practical way. They felt that only by a scheme behind which were all the resources of the Commonwealth and States could a general collapse of the wheat market be avoided. The private wheat-buying firms were prepared to buy only up to the amount of freight tonnage actually allotted to them. **Only the Governments of Australia could shoulder the great responsibility** of handling the entire crop and taking the risk of insufficient freight and a falling wheat market.

GOVERNMENT TAKES ALL THE RISK.

The risks the Government take in the freight and wheat market are very great. They involve many millions! No private firm or combination of firms would take such risks. The farmer is not asked to share these risks, and, on the other hand, he gets all its benefits, and these benefits are great. In the first place, he gets 2s. 6d. per bushel for his wheat delivered at the nearest railway station, which is equal to about 3s. f.o.b., Melbourne. Assuming the wheat crop to average 4s. 6d. f.o.b. throughout the season, that advance of 3s. is equal to two-thirds of the f.o.b. value. That advance is as large as the States can afford to risk, or as the banks could be asked to carry. And the farmer gets this just the same if the market falls so much that 3s. is equal to the actual f.o.b. price! He gets this 3s. at once, and gets the balance at the close of the season. The farmer thus will receive every penny his wheat realizes, less freight, insurance, and cost of handling. Under the scheme every farmer will get the same equitable treatment. The small farmer will not be left out in the cold; he will get as much for his wheat, and he will only pay as much for freight and handling, as the big farmer. If it were not for this scheme more than one-half of the farmers of Australia would have been ruined. Let the farmer look at the position quietly.

The Government have stepped in because this is a great national question. It is not only of vital importance to the farmer that he should get the advantage of high prices, but that he should get cash immediately in order to meet his liabilities. It is also vital to the welfare of Australia and the Empire that this great wheat crop should be profitably marketed.

THE POSITION OF THE FARMER BUT FOR THE GOVERNMENT SCHEME.

Wheat is 7s. a bushel in London now. What will it be in February? What will be the price in May? No one knows! It might not be 5s. Admittedly prices are abnormal. It looks as though they may keep up

but no one can be certain of it. The difference between the value of the Australian wheat crop at 7s. a bushel and 5s. a bushel is £15,000,000. The difference between freights at 85s. and 120s. is £4,550,000. These fluctuations in the wheat and freight markets are not only possible, but probable. Who could buy, except at wrecked prices in such circumstances?

Is is not clear as noonday that in the face of all these facts a panic would have been inevitable? Farmers would have rushed their wheat in, falling over each other in the effort to realize on their wheat. What could wheat have been worth in such a case? Certainly not 4s. nett. It may be urged that private firms would have financed the farmers. Would they? To what extent, and upon what terms? No private firm or combination of private firms could be expected to shoulder a risk of having anything up to 2,000,000 tons of wheat thrown on their hands. For unless they could get the wheat to Europe while prices were high, they would lose millions. Who would pay the farmer cash for his wheat on the present basis of prices and remain out of his money for that period, taking the risk of a collapse of the market? No one would do it. Millers could have bought wheat at their own price. In plain words, but for this scheme the farmer would not have got a fair price for his wheat. He could not have got anything approaching it. **No one but the Governments would have advanced 3s. per bushel on it.**

But for the Government's scheme at the end of January, nine bushels out of every ten would have found no buyers; by the end of February not one bushel out of four could be sold; even by the end of May—if freight comes in as freely as for January, a most improbable event—not one-half the harvest could have found buyers. So that at the end of six months from now, if the Government had not stepped in, half the crops would have been unsold. The local market would have been demoralized, the benefits of high prices lost, the cash advance of 3s. impossible.

HANDLING CHARGES.

The charges payable by the Victorian Commission to agents are as follows:—

Total cost of receiving, weighing, sampling, stacking, trucking, being responsible for condition and quality of the wheat, storing, and delivering into ships' slings—3¼d. per bushel.

When wheat is railed to millers—1¼d. per bushel.

When wheat is received at mills from farmers' waggons—¼d. per bushel.

These have been the subject of much criticism. It is contended that they are too high; but it will be remembered that in the first place the more important agents asked that 3¾d. be given for the complete work of taking delivery at the stations and placing in the ships' slings. At a conference between the agent firms and farmers held in Melbourne, at which representatives from various agricultural interests were present, including the Farmers and Settlers' Association of New South Wales, the Chamber of Agriculture of Victoria, as well as other representative farmers, it was decided that the charges should be 3⅝d. Both parties signed the agreement, which was arrived at after very lengthy discussion and a comprehensive review of the whole situation. Subsequently the representatives of the Federal and State Governments had the charges reduced to 3½d.

REVIEW OF CHARGES.

It is contended in some quarters that even this charge of 3½d. is too high. The Central Board of Control (of which the Prime Minister is Chairman, and the Ministers of Agriculture for the wheat-producing States are members) has left all matters of detail to Mr. Hughes and Mr. Hagelthorn, and they have arranged that all charges shall from time to time be reviewed, and that the commissions will be subject to reducton if it is found, after a rigid examination, that they will afford more than a reasonable remuneration for the agents. Any reduction will operate from the commencement of the scheme, so that farmers who receive early advances will be in no way prejudiced thereby.

There are many conflicting estimates of what should be considered fair charges under present conditions. Experts themselves who are not interested in the scheme make widely differing estimates. Obviously the question of fair remuneration to agents largely depends on the length of the season over which shipping must be spread, the cost of labour, the number of rejects, and quite a number of varying factors which it is impossible at the inception of the season to estimate. Shippers, under normal conditions, have to make full allowance in their charges for all such contingencies, and the Central Board of Control has laid down the principle that the wheat must not be handled at exorbitant charges. Agents should be paid a fair remuneration for their services, and no more.

GAIN IN WEIGHT.

The whole of the gain in weight on shipments, which is an appreciable quantity, will be for the benefit of the pool, and therefore of the farmer. That gain in ordinary circumstances goes to the shipper.

FINANCE.

The money to be found for the financing of the scheme will amount to several millions. That money will be provided at the low rate of 5 per cent., a rate at which it is certain that few farmers or others can borrow to-day. No such rate could have been secured from any public or private institution, and even the Dominion of Canada is unable to borrow on such terms. But for the intervention of the Government, probably rates as high as 7 per cent. or 8 per cent. would have had to have been paid. It is not proposed to charge any interest directly on the advances obtained by farmers, but the interest will be charged as expenses on the proceeds of the whole crop, and deducted on the final adjustment of accounts.

Certificates will be forwarded to farmers showing the quantity of wheat they have delivered, and advances will be made on presentation of these certificates at the banks. Should a farmer refrain from taking the advance from the Government, his certificate will bear interest at the rate of 4 per cent. per annum. The certificates will be negotiable, and should it be possible for a farmer to secure a further advance from other sources, there is nothing to prevent his obtaining it. He may, either before or after he has availed himself of the Government advance, sell his certificate outright, and the announcing of sales to millers and others for internal consumption, as well as sales of cargoes from week to week, will enable farmers to have a very good idea of what their certificates are likely to be worth.

Should the marketing of wheat proceed satisfactorily, it is hoped that a further advance may be given to farmers about the end of June. Should the present prices continue, and shipping be available as anticipated, it should be possible to make a further advance of from 9d. to 1s. per bushel.

FARMERS SHAREHOLDERS IN THE POOL.

Under normal conditions, when a farmer sells his wheat and obtains his cheque from the buyer, he has no further interest in his wheat. Under this scheme he remains a shareholder until the final adjustment is made, and any indifferent wheat or badly-cleaned wheat will have the effect of reducing the fair average quality of Victorian wheat. It behoves every farmer who becomes a shareholder to see that his wheat is thoroughly cleaned and delivered in the best possible condition, so that the general interests may be best served. The whole scheme may be described as a co-operative realization of the harvest, with the State acting as manager, and the success of the scheme, to a large extent, depends on the whole-hearted co-operation of all the shareholders.

BOARDS OF CONTROL.

The Government has spared no pains to secure the best possible advice from the ablest men in Victoria. The Prime Minister and the Ministers for Agriculture of the four wheat-growing States will act as an Inter-State Board to control the shipping, marketing abroad, and fixing the price of wheat for Inter-State consumption, and controlling finance. They will be assisted in their work by a staff of experienced and trusted officers, as well as by the best experts procurable in the shipping and handling of grain. The control of the harvest in the State will be vested in the Minister for Agriculture supported by an Advisory Committee consisting of—

Hon. W. L. Baillieu, M.L.C.
Hon. W. Hutchinson, M.L.A., Minister of Lands.
Mr. Denison Miller, Governor of the Commonwealth Bank.
Mr. O. M. Williams, Chairman of the Associated Banks.
Dr. S. S. Cameron, Director of Agriculture.
Mr. C. W. Wood, President, Chamber of Agriculture.
Mr. E. H. Lascelles.
Mr. J. Minifie.

This Committee, it is thought, is sufficiently representative to justify the farmers placing their fullest confidence in it, and—as in the case of the Inter-State Board—it will have the assistance of experts in all branches of its work. Messrs. J. Darling and Son, James Bell and Company, and Dalgety and Company Limited will be the experts advising them in regard to the handling of the wheat and the disposal of same. All are reputable firms with long experience in this class of work. Farmers, too, will be gratified to know that the services of Mr. J. Weldon Power have been secured as legal adviser. He is a gentleman who has perhaps been more prominently identified with agriculture and Agricultural Associations' work in Victoria than any other man.

A London Board, consisting of the High Commissioner and the Agents-General of the States interested, will supervise the sales of cargoes in London.

AGENTS TO HANDLE THE SCHEME.

The following agents have been appointed to handle the wheat in Victoria:—

Messrs. J. Darling and Son.
Messrs. James Bell and Company.
Messrs. L. Dreyfus and Company.
Messrs. F. W. Prell and Company.

It has been announced that, as far as possible, existing organizations for handling the wheat will be disturbed as little as possible, but the

Government recognised that they would have to secure the very best services for doing this work effectively, and that the responsibility must not be placed in too many hands if that work were to be best done. Several smaller firms will no doubt complain that the largest firms have secured a monopoly, and that their business will suffer thereby, but the Government could not take any risks of ineffective working by having too many agents appointed. Some firms have been doing a great deal of work in past years in buying wheat in the country without doing much in shipping, whilst others have done a good deal of shipping without having organizations to purchase in the country. Both of these classes of operators have been eliminated, because the Government regarded it as essential that its agents should have the necessary organization for undertaking the complete work. The agents appointed, however, have undertaken to provide as far as possible for the employment of all those who can give effective service in the handling of Victoria's grain crop. The interests of some that have been doing work in the past must suffer. Merchants, for instance, who have been in the habit of storing grain for farmers, and earning commissions by the sale of wheat at auction, will find their incomes diminished this season. Many small brokers in the city will be unable to secure any commissions on the sales of wheat, because the Government will be the only seller. It is to be regretted that some sacrifice must be made by such firms or persons, but in the interests of the efficiency and economy of the scheme such sacrifices were unavoidable.

COMMENCEMENT OF THE SCHEME.

The scheme comes into operation on Wednesday, 1st December, and after that date no direct sales will be permitted. Farmers may take their grain direct to mills or railway stations, where it will be received in the usual way. They must satisfy themselves, as heretofore, in regard to the weight of their wheat, as well as to the deductions that may be made for anything less than fair average quality; that is to say, if they are dissatisfied with the miller's deduction from the f.a.q. of any of their wheat, they may have such wheat placed aside in the mill, and the dispute settled by an agent or inspector, who will be appointed for the purpose.

COMPLAINTS WILL ARISE.

It is impossible in carrying out a scheme of such magnitude to avoid complaints being made. Under normal conditions, when a farmer is delayed at a railway station with his team, owing to congestion of wheat to be delivered, he makes loud and long complaints. These complaints end at the railway station. Under this scheme many of these complaints will reach the Government. There will be other complaints in regard to settlement for wheat delivered. In some cases they will

be due to mistakes of the farmers themselves, and in others to the agents, and, perhaps, in some cases, to the Central Office staff in Melbourne; but it is hoped that, with the assistance of farmers, the scheme will, on the whole, work smoothly. Cause for complaints that must necessarily arise from time to time will be adjusted as quickly as possible. Any complaints that cannot be adjusted by agents should be addressed to the Secretary of the Victorian Wheat Commission, Broken Hill Chambers, Queen-street, Melbourne.

THE PRIME MINISTER.

It is but fair to let farmers know that the Prime Minister of the Commonwealth has thrown himself whole-heartedly into this scheme—the scheme outlined by the Victorian Government—and to him we are much indebted for both the quantity of shipping secured and the comparatively low prices at which it has been made available. He should also be thanked for the remarkably low price at which the money required to finance the scheme has been secured. His presence in London during the shipping and marketing of the bulk of the wheat will be of very great assistance to all interested in the scheme.

CONCLUSION.

Farmers and all concerned may rest satisfied that I, as chief executive officer in Victoria, and those associated with me, will leave nothing undone that is humanly possible to make the scheme successful and of benefit to the farmers and the people of Victoria. In a scheme such as has been launched for the first time—the biggest pool ever attempted in the Southern Hemisphere—difficulties will continuously crop up. We are all prepared to be subjected to adverse criticism from time to time, but we can only hope that the ability possessed by those who are in control, placed at the disposal of the farmers and people of Victoria, will result in the end in satisfying all concerned.

The scheme agreed upon, before being adopted, was subjected to most careful examination. Every provision has literally had to run the gauntlet of the keenest criticism of the best brains in the business and financial world. It is not claimed that it is perfect, but the Governments concerned boldly assert that it is a practicable scheme, adequate to meet the extraordinary circumstances by which we are faced, safeguarding the interests of the farmers and of the community generally, and resting upon an absolutely impregnable financial foundation.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE, VICTORIA.

VOLUME XIII. Parts 1–12.

INDEX.

	Page
Adcock, G. H.—	
Survey of the Commoner Weeds, Rutherglen Experiment Farm	41
Agricultural Societies, Annual Grant to, Subsidy Conditions	72
Agricultural Statistics, Victorian	[illegible], 633
Alfalfa (Lucerne) Milling in California	498
Allan, F. E.—	
Rabbit Destruction	440
Amortization	339
Angora Goats and Mohair Growing	760
Apiculture—	
Bee-keeping	217
Honey Flora, The	65, 138, 300, 391, 482, 619, 667
Apple Syrup, A New Product ...	674
Archer, R. T.—	
Milking Machines in Victoria	33
Pig Industry, The	257
Temperatures for Maturing Cheddar Cheese	179
Artificial Manures Acts—Unit Values for 1915	11
Baker, G. H. F.—	
Conserve the Natural Pasture —*Stack Silage*	679
Baking and Milling Tests on Argentine and Walla Wheats	661, 736
Barley Tests, Experimental Plots at *Wortham*	162
Barleys and Peas, Results of Tests of Imported Varieties of	603
Bayonet Grass ...	413, 762
Bee-keeping (see Apiculture).	
Beef and Butter—Red Poll Milkers	456
Beet Sugar, A	767
Beet Sugar Production of the United States, 1913	23
Beuhne, F. R.—	
Bee-keeping	217
Bee-keeping in Victoria	65, 138, 300, *391*, 482, *619*, *667*
Blazey, C., M.Sc.—	
Summary of Rutherglen Weather	632
Botrytis Disease or Grey Mould of Citrus Trees	605
Branding, Uniform System of—Fruit Forwarded to New South Wales	137
Breeding Rack, A	734
Briggs, L. J., M.S., Ph.D.—	
Dry Farming Investigations in the United States ...	449, 577
Brittlebank, C. C.—	
Grey Mould or Botrytis Disease of Citrus Trees ...	605
Burnley—Victorian Egg-laying Competitions, 1914-15-16	62, 126, 186, 251, 315, 380, 441, 507, 571, 636, 696, 763
Butter and Beef—Red Poll Milkers	456
Butter and Milk Yellow, What Makes	666
Calcium Cyanamide	305
Cans, Fly Excluder from Milk and Cream	693
Carmody, P. J.—	
Fruit Prospects for 1915-16 ...	753
Peanut, The	163
Castella, F. de—	
Pruning the Ohanez and some other Shy-bearing Vines ...	461
Sulphiting and the War ...	681
Sweet Wines of Moderate Alcoholic Strength	85
Vine Prunings as Fodder ...	310
Vine-growers' Field Day at Rutherglen	271
Certification of Stallions, Government	277
Chaff-house, Implement Shed, Eight-bail Milking Shed ...	374
Channel Gate	613
Cheddar Cheese, Temperatures for Maturing	179
Cheese, Quicksilver in ...	486
Cheese-making, Culture-starters *for*, Propagation of	688
Citrus Trees, The Grey Mould or Botrytis, Disease of ...	605
Classing Wool	601

Page

Cock, S. A.—
Use, Construction, and Cost of Concrete Channels and Underground Pipe Lines in Orchard Irrigation ... 213
Cockschafer Grubs—An Insect Pest of Lucerne 567
Cole, C. F.—
Walnut, The 76, 146, 246, 307, 437, 469, 593, 684, 744
Conserve the Natural Pasture—Stack Silage 679
Cool Storage 1
Cool Stores, Government, Victoria Dock 1
Cost of Production of Field Crops (Wheat) 406
Cow, Some Useful Hints about Milking 95
Cows, Standard Test—
Quarterly Reports 99, 349, 748
Third Annual Report . 513
Cream and Milk, Care of .. 161
Crowe, R.—
Government Cool Stores, Victoria Dock 1
Review of the Victorian Dairying Season 1914-15 .. 385
Cultivation—
Cost of Production of Field Crops (Wheat) 406
Cultivation of Medicinal Plants 608
Dry-farming Investigations in the United States ... 449, 577
Irrigated Lucerne at Central Research Farm, Werribee ... 103
Linseed Production 719
Longerenong Agricultural College Farmers' Field Day ... 705
Maize-producing Industry in Victoria 129, 237, 367, 474, 590, 675
Orchard and Garden Notes, 59, 124, 189, 254, 317, 382, 443, 509, 573, 638, 701, 765
Peanut, The 163
Results of Field Tests with Wheat at Experiment Farms, Season 1914 193
Results of Lucerne Tests, Season 1914-15 417
Results of Tests of Imported Varieties of Peas and Barleys 603
Results of Tests, 1914, Longerenong College 202
Seeding Notes 229
Wheat and the War 545
Culture-starters for Cheese-making, Propagation of ... 688
Curlewis, A. W.—
Sheep Dipping 752

Dairying—
Butter and Beef—Red Poll Milkers 456
Care of Milk and Cream . 161
Eight-bail Milking Shed, Chaff House, and Implement Shed 374
Feed and Cows' Milk . 228
Fly Excluder from Milk and Cream Cans 693
Manager, The—His Influence on the Output 494
Methods of Milk Recording in Scotland 740
Milking Machines in Victoria 33
Pasteurization of Milk ... 687
Pasteurization of Whey ... 761
Prickly Pear for Dairy Cows 102
Propagation of Culture-starters for Cheese-making 688
Quicksilver in Cheese ... 486
Red Poll Dairy Cattle, Report on *Departmental Herd*, Season 1914-15 553
Review of the Victorian Dairying Season, 1914-15 ... 385
Some Useful Hints about Milking the Cow 95
Standard Test Cows, 99, 349, 513, 748
Temperatures for Maturing Cheddar Cheese 179
What Makes Milk and Butter Yellow? 666
World's Champion Red Poll "Muria" 541
Dairying Season 1914-15, Review of Victorian 385
Dehorning, Effect of 153
Dipping Sheep 752
Disinfectant Whitewash, A ... 758
Dry-farming Investigations in the United States ... 449, 577
Economical Feeding of Stock ... 414
Egg-laying Competitions, Burnley, 1914-15-16 62, 126, 186, 251, 315, 380, 441, 507, 571, 636, 696, 763
Egg-laying Competition at Burnley, 1914-15, Report on .. 321
Ewart, A. J., D.Sc., Ph.D.—
Influence of Nitrates on the Development of Root Tubercles 759
Ewart, A. J., D.Sc., Ph.D., and Sutton, C. S., M.B., Ch.B.—
Vernacular names of Victorian Plants 487
Farm-yard Manure 569
Farmers' Field Day—Longerenong Agricultural College ... 705
Fats in Food 735
Feed and Cows' Milk ... 228
Fertilizer, New Type of Artificial 304
Fertilizers in Japan 416
Fertilizers, Reminders for those Buying Artificial 22

Page

Field Crops, Cost of Production (Wheat) 406
Field Tests with Wheat at Experiment Farms, Season 1914 193
Financing the Harvest .. 713
Fly Excluder from Milk or Cream Cans 693
Fodder—
Comparative Values of Stock Food 446
Conserve the Natural Pasture —Stack Silage 679
Economical Feeding of Stock 414
Feed and Cows' Milk ... 228
Herb of the "Sweet Potato" as a Fodder for Stock ... 181
Irrigated Lucerne at Central Research Farm, Werribee ... 103
Milling Alfalfa (Lucerne) in California 498
Pig Feed 447
Results of Lucerne Tests, Season *1914-15* 417
Vine Prunings as Fodder ... 310
Food, Fats in 735
Food Stock, Comparative Values of 446
Forestry in Australia 169
French, C., jun.—
An *Insect Pest of Lucerne* (Cockschafer Grubs) ... 567
French, C., jun., and Harris, S. G.—
Potato Moth, The 614
Fruit Forwarded to New South Wales—
Uniform System of Branding 137
Fruit Prospects for 1915-16 ... 753
Fruit Trade of Victoria and the War, The 725
Garden and Orchard Notes 59, 124, 189, 254, 317, 382, 443, 509, 573, 638, 701, 765
Gate, Channel 613
Gordon, G. S.—
Summary of Meteorological Observations, Central Research Farm, Werribee, 1914 145
Government Cool Stores, Victoria Dock 1
Grapes, a Test of Commercial *Fertilizers for* 58
Greybox Trees (Eucalyptus), Horses Attacking 716
Grey Mould or Botrytis Disease of Citrus Trees 605
Ham, H. W.—
Sheep and Wool Terms ... 565
Wool Terms 690
Harris, S. G., and French, C., jun.—
Potato Moth, The 614
Hart, A.—
Egg-laying Competition, Burnley, 1914, *1915*, *1916* 63, *126*, 186, 251, 315, 380, 441, 507, 571, 636, 696, 763

Page

Hart, A.—*continued.*
Report on the Fourth Egg-laying Competition, Burnley, 1914-15 321
Harvest, Financing The ... 713
Harvest, Wheat, Victorian, 1914-15 Season—Pre-Harvest Estimate 62
Harvesting Lucerne Hay, Note on the Cost 249
Hogs, Loading with Crate ... 503
Hints, Home 694
Hooper, H. B.—
Fly Excluder from Milk or Cream Cans 693
Horses—
Government Certification of Stallions—Eighth Annual Report 277
Horse's Foot and its Care, The 353
Horses Attacking Greybox Trees (Eucalyptus) ... 716
Horticulture—
Fruit Prospects for 1915-16 ... 753
Olive, The 154, 221, 499
Orchard and Garden Notes 59, 124, 189, 254, 317, 382, 443, 509, 573, 638, 701, 765
Use, Construction, and Cost of Concrete Channels and Underground Pipe Lines in *Orchard Irrigation* .. 213
Hunt, H. A.—
Rainfall in Victoria *183*, *503*, *630*, 698
Implement Shed, Eight-bail Milking Shed, Chaff House .. 374
Insect Pest of Lucerne, An (Cockschafer Grub) 567
Insurance—
Workers Compensation Act 1914 626
Kerr, R. R.—
Red Poll Dairy Cattle—Report on—
Departmental Herd, Season 1914-15 553
Some Useful Hints about Milking the Cow ... 95
World's Champion Red Poll, "Muria" 541
Lauder, Alexr., D.Sc.—
Methods of Milk Recording in Scotland 740
Laughton, A. M.—
Return of Live Stock in Victoria, March, 1915 ... 405
Victorian Agricultural Statistics 506, 633
Victorian Wheat Harvest, Season 1914-15—Pre-Harvest Estimate 62
Wool Clip and Estimated Total Production, Season 1914-15, and Four Previous Seasons 436
Lime, Guarantees for 216
Linseed Production 719

Page

Live Stock in Victoria, March, 1915, Return of 405
Longerenong Agricultural College—Farmers' Field Day, 1915 705
Longerenong Agricultural College—Results of Tests, 1914 ... 202
Losses, War 703
Lucerne (Alfalfa) Milling in California 498
Lucerne, An Insect Pest of (Cockschafer Grubs) ... 567
Lucerne, Hay, Note on the Cost of Harvesting 249
Lucerne Irrigated at Central Research Farm, Werribee ... 163
Lucerne Tests, Results of Season, 1914-15 — Central Research Farm, Werribee 417
Macdonald, L.—
Olive, The 154, 221, 499
McFadzean, J. S.—
Manager, The—His Influence on the Output 494
Mackay, H. R.—
Forestry in Australia ... 169
McKenzie, R. T.—
Farm-yard Manure 569
Maize-producing Industry in Victoria 129, 237, 367, 474, 590, 675
Manager, The—His Influence on the Output 494
Manures—
Alsatian Potash .. . 192
Artificial Manures Acts—Unit Values for 1915 . 11
Calcium Cyanamide 305
Farm-yard Manure 569
Fertilizers in Japan ... 416
Green Manuring Experiments 251
Influence of Nitrates on the Development of Root Tubercles 759
New Type of Artificial Fertilizer 304
Potash from Wool Washing ... 186
Reminders for those Buying Artificial Fertilizers ... 22
Reserve Supply of Phosphate Rock in the United States 23
Shoddy as a Fertilizer ... 314
Sodium Chloride (Common Salt) used as a Manure ... 10
Sulphur and Pyrites as Fertilizers 468
Medicinal Plants Cultivation of 608
Meeking, Ernest—
Fruit Trade of Victoria and the War, The 725
Mess, Alexr.—
Care of Milk and Cream, The 161
Meteorological Observations, Summary of—Central Research Farm, Werribee, 1914 ... 145
Milk and Butter, Yellow, what makes 666
Milk and Cream, Care of ... 161
Milk, Pasteurization of ... 687

Page

Milk Recording in Scotland, Methods of 740
Milking Machines in Victoria .. 33
Milking the Cows, Some Useful Hints About 95
Milking-shed, Eight-bail, Chaff-house, and Implement Shed ... 374
Milling Alfalfa (Lucerne) in California 498
Milling and Baking Tests on Argentine and Walla Wheats 661, 736
Mohair Growing and Angora Goats 760
Nitrates on the Development of Root Tubercles, The Influence of 759
Ohanez and some other Shy Bearing Vines, Pruning ... 461
Olive, The 154, 221, 499
Orange, Ripe, When is an ... 348
Orchard and Garden Notes 59, 124, 189, 254, 317, 382, 443, 509, 573, 638, 701, 765
Pasteurization of Milk ... 687
Pasteurization of Whey ... 761
Pasture, Conserve the Natural—Stack Silage 679
Paterson, J. W., B.Sc., Ph.D.—
Economical Feeding of Stock 414
Peanut, The 163
Peas and Barley, Results of Tests of Imported Varieties of 603
Pescott, E. E.—
Orchard and Garden Notes 59, 124, 189, 254, 317, 382, 443, 509, 573, 638, 701, 765
Phosphate Rock in the United States, The Reserve Supply ... 23
Phosphoric Acid in Rock Phosphate, Solubility of 61
Phylloxera-resistant Vine Rootlings and Cuttings, Conditions Governing Distribution of ... 81
Pig Feed 447
Pig Industry, The—
Housing Pigs 257
Pigs (Loading Hogs with Crate) 503
Plants—
Vernacular Names of Victorian Plants 487
Cultivation of Medicinal Plants 608
Potash, Alsatian 192
Potash from Wool Washing ... 186
Potato Moth, The 614
Potato Production, Profitable .. 718
Potatoes, Experiments in the Cultivation of 1914-15 ... 340
Poultry—
Egg-laying Competitions at Burnley, 1914, 1915, 1916 63, 126, 186, 251, 315, 380, 441, 507, 571, 636, 696, 763
Report on the Fourth Egg-laying Competition, Burnley, 1914-15 321

	Page
Prickly Pear for Dairy Cows ...	102
Pritchard, L. B., B. Agr. Sc.—	
Soil Temperature	399
Quicksilver in Cheese	486
Rabbit Destruction	440
Rack, A Breeding	734
Rainfall in Victoria 183, 503, 630,	698
Ramsay, J. T.—	
Experiments in the Cultivation of Potatoes, 1914-15 ...	340
Profitable Potato Production	718
Red Poll Dairy Cattle—	
Butter and Beef—Red Poll Milkers	456
Report on the Departmental Herd, Season 1914-15 ...	553
World's Champion "Muria"	541
Reminders for the Month 191, 255, 319, 384, 448, 511, 575, 640, 703,	768
Reminders for those Buying Artificial Fertilizers	22
Renner, G.—	
Herb of the Sweet Potato (*Ipomoea batatas*) as a fodder for Stock	181
Research Farm, Werribee, Central—	
Cost of Production of Field Corps (Wheat)	406
Irrigated Lucerne at Central *Research Farm, Werribee* ...	103
Prizes Won at Werribee Show, 1915	695
Results of Lucerne Tests, Season 1914-15	417
Results of Tests of Imported Varieties of Peas and Barleys	603
Summary of Meteorological *Observations*	145
Teachers' Farm School ...	641
Review of the Victorian Dairying Season, 1914-15	385
Richardson, A. E. V., M.A., B.Sc.—	
Irrigated Lucerne, Central Research Farm, Werribee ...	103
Note on the Cost of Harvesting Lucerne Hay	249
Results of Field Tests with Wheat at Experiment Farms, Season 1914	193
Results of Lucerne Tests, Season 1914-15	417
Seeding Notes	229
Wheat and the War ...	545
Robertson, W. A. N., B.V.Sc.—	
Government, Certification of—	
Stallions, Eighth Annual Report	277
Horse's Foot and its Care ...	353
Standard Test Cows, Third Annual Report	513
Robertson, W. C.—	
Reminders for those Buying Artificial Fertilizers ...	22
Root Tubercles, The Influence of Nitrates on the Development of	759
Rose Disease, A New	702
Rutherglen Experiment Farm, Survey of the Commoner Weeds	41
Rutherglen Weather, Summary of	632
Sawers, G. C.—	
Propagation of Culture Starters for Cheese-making	688
School, Teachers' Farm ...	641
Scott, P. R.—	
Artificial Manures Acts—Unit Values 1915	11
Horses Attacking Grey Box Trees (Eucalyptus) ...	716
Scott, P. R., and Winslow, F. G. B.—	
Milling and Baking Tests on Argentine and Walla Wheats ... 661,	736
Seeding Notes	229
Sheep and Wool Terms ...	565
Sheep Dipping	752
Shoddy as a Fertilizer ...	314
Silage Stack—Conserve the Natural Pasture	679
Smith, T. A. J.—	
Bayonet Grass ... 413,	762
Linseed Production	719
Maize-producing Industry in Victoria 129, 237, 367, 474, 590,	675
Tobacco Beds for Blue Mould	398
Sodium Chloride (Common Salt) Used as a Manure	10
Soil Temperature	399
Solubility of Phosphoric Acid in Rock Phosphate	61
Stack Silage—Conserve the Natural Pasture	679
Stallions, Government Certification of	277
Standard Test Cows ... 99, 349, 513,	748
Statistics, Victorian Agricultural 506,	633
Stock, Economical Feeding of ...	414
Stock Food, Comparative Values of	446
Stock in Victoria, March, 1915, Return of	405
Subsidy Conditions, *1915* ...	72
Sugar Beet, A	767
Sulphiting and the War ...	681
Sulphur and Pyrites as Fertilizers	468
Sweet Potatoes (*Ipomoea batatas*) as a Fodder for Stock ...	181
Sweet Wines of Moderate Alcoholic Strength	85

Page

Sutton, C. S., M.B., Ch.B., and Ewart, A. J., D.Sc., Ph.D.—
Vernacular Names of Victorian Plants 487
Sweet Potato (*Ipomoea batatas*) as a Fodder for Stock ... 181
Teachers' Farm School ... 641
Temperature, Soil 399
Temperatures for Maturing Cheddar Cheese 179
Tests, 1914, Longerenong College, Results of 202
Thomas Phosphate (Basic Slag) 228
Tobacco Beds for Blue Mould 398
Tulloh, I. M.—
Results of Tests, 1914, Longerenong Agricultural College 202
Use, Construction, and Cost of Concrete Channels and Underground Pipe Lines in Orchard Irrigation 218
Vernacular Names of Victorian Plants 487
Veterinary School, The Melbourne University 24
Vine Prunings as Fodder ... 310
Vinegar from Water Melons ... 603
Vinegrowers' Field Day at Rutherglen 271
Vineyards, Planting and Reconstitution 81
Viticulture—
Planting and Re-constitution of Vineyards. Conditions Governing the Distribution of Phylloxera-Resistant Vine Cuttings and Rootlings ... 81
Pruning the Ohanez and some other Shy-bearing Vines ... 461
Sulphiting and the War ... 681
Sweet Wines of Moderate Alcoholic Strength ... 85
Test of Commercial Fertilizers for Grapes 58
Vinegrowers' Field Day at Rutherglen 271
Vine Prunings as Fodder ... 311
Wine Yield of the World, 1914 739
Walnut, The 76, 146, 246, 307, 437, 469, 593, 684, 744
Water Melons, Vinegar from ... 603
Weather, Summary of Rutherglen 632

Page

Weeds, Survey of the Commoner. Rutherglen Experiment Farm 41
Weight, Gain in 212
Werribee Research Farm. *See* Research Farm.
Wheat—
Amount of Seed per Acre to Produce Highest Results ... 126
Cost of Production of Field Crops 406
Financing the Harvest ... 713
Highest Known Number of Stools per Grain of Wheat 126
Highest Number of Grains per head 126
Milling and Baking Tests on Argentine and Walla Wheats 661, 736
Results of Field Tests with Wheat at Experiment Farms, Season 1914 193
Wheat and the War ... 545
Wheatgrowing at Mitta Mitta 220
Wheat and the War 545
Wheat Harvest, Season 1914-15, Victorian Pre-harvest Estimate 62
Whey, Pasteurization of ... 761
Whelan, A. J., and Wilson, H. C.—
Cost of Production of Field Crops (Wheat) 406
Whitewash Disinfectant, A ... 758
Wilson, J.—
Eight-Bail Milking Shed, Chaff House, and Implement Shed 374
Wilson, H. C., and Whelan, A. J.—
Cost of Production of Field Crops (Wheat) 406
Wine Yield of the World, 1914, The 739
Winslow, F. G. B., and Scott P. R.—
Milling and Baking Tests on Argentine and Walla Wheats 661, 736
Wool Classing 601
Wool Clip and Estimated Total Production, Season 1914-15, and Four Previous Seasons ... 436
Wool Terms 690
Workers' Compensation Act 1914 626